“COMPARISON OF McCoy AND AIRTRAQ LARYNGOSCOPES - IN EFFICACY OF LARYNGOSCOPY, INTUBATING CONDITION AND HAEMODYNAMIC STABILITY”

Dissertation submitted to
The Tamil Nadu Dr.M.G.R. Medical University
Chennai – 600032.
In partial fulfilment of the regulations for the Degree of

M.D.ANAESTHESIOLOGY
BRANCH – X

Under the guidance of
Dr.N.Jothi M.D., D.A.,
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DEPARTMENT OF ANAESTHESIOLOGY
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This is to certify that this dissertation titled **"Comparison of McCoy and Airtraq laryngoscopes - in efficacy of laryngoscopy, intubating condition and haemodynamic stability"** is a bonafide work of **Dr.R.Srilekha.**, Post Graduate in M.D.Anaesthesiology, **Department of Anaesthesiology, K.A.P.V. Government Medical College, Trichy** and has been prepared by her under our guidance. This has been submitted in partial fulfilment of regulations of The Tamil Nadu Dr. M.G.R. Medical University, Chennai - 32 for the award of M.D. Degree in Anaesthesiology.

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I **Dr.R.SRILEKHA.**, solemnly declare that this dissertation titled **“Comparison of McCoy and Airtraq laryngoscopes - in efficacy of laryngoscopy, intubating condition and haemodynamic stability”**, is a bonafide work done by me at K.A.P.V. Government Medical College, during 2012-2014 under the guidance and supervision of **Dr.N.JOTHI M.D.,D.A.,** Professor and Head Of the department, Department of anaesthesiology, K.A.P.V. Government Medical College, Trichy.

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This is to certify that the project work titled Comparison of laryngoscopy, intubating condition and hemodynamic stability with McCoy & Airtraq proposed by Dr.R.Srilekha part of fulfillment of M.D/M.S course in the subject of Anaesthesiology for the year 2012-2015 by The Tamilnadu Dr.MGR Medical University has been cleared by the ethics committee.

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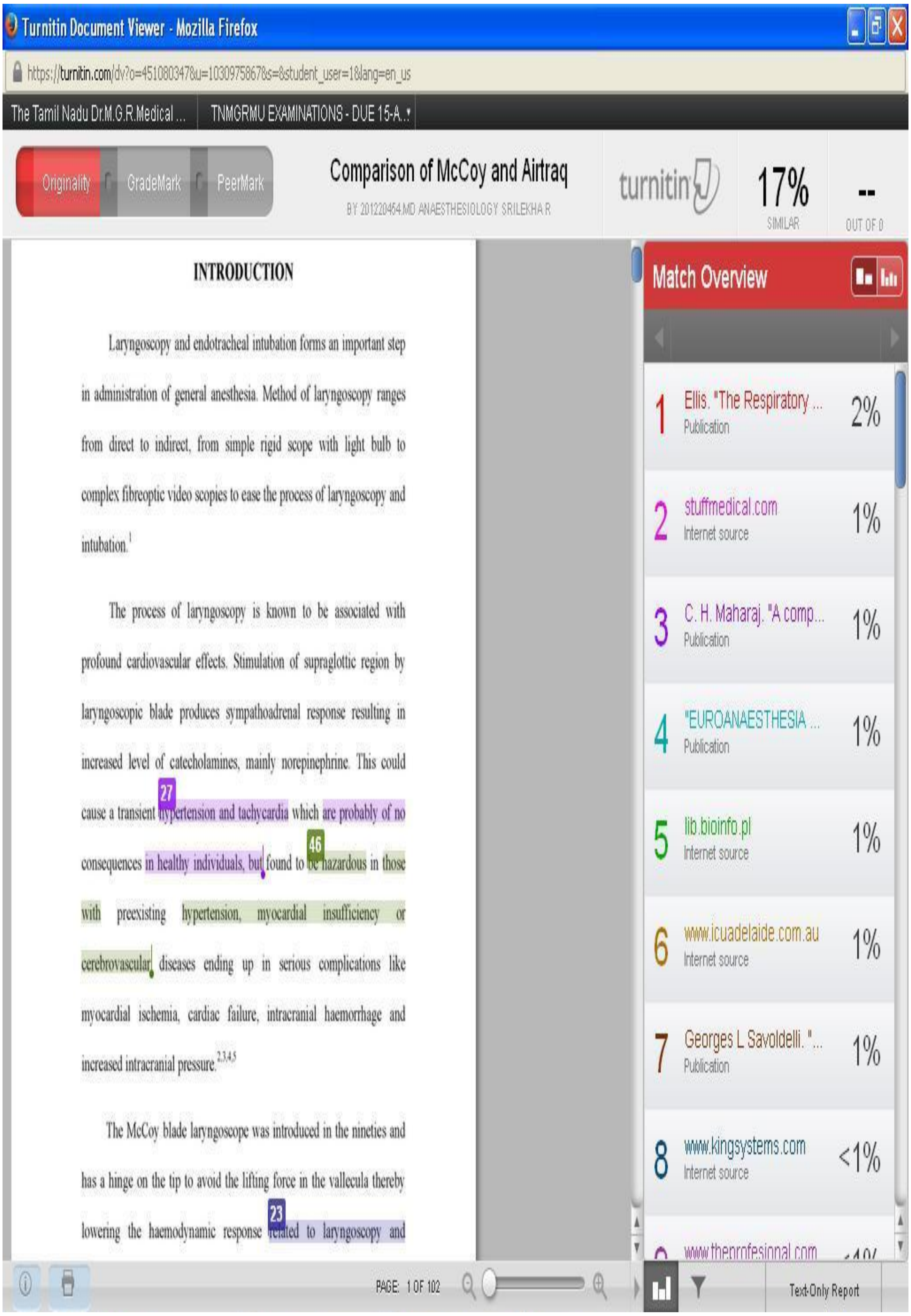
INTRODUCTION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INTRODUCTION
Laryngoscopy and endotracheal intubation forms an important step in administration of general anesthesia. Method of laryngoscopy ranges from direct to indirect, from simple rigid scope with light bulb to complex fibreoptic video scopies to ease the process of laryngoscopy and intubation.[1]
The process of laryngoscopy is known to be associated with profound cardiovascular effects. Stimulation of supraglottic region by laryngoscopic blade produces sympathoadrenal response resulting in increased level of catecholamines, mainly norepinephrine. This could cause a transient hypertension and tachycardia which are probably of no consequences in healthy individuals, but found to be hazardous in those with preexisting hypertension, myocardial insufficiency or cerebrovascular diseases ending up in serious complications like myocardial ischemia, cardiac failure, intracranial haemorrhage and increased intracranial pressure.[2,3,4,5]
The McCoy blade laryngoscope was introduced in the nineties and has a hinge on the tip to avoid the lifting force in the vallecula thereby lowering the haemodynamic response related to laryngoscopy and
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LIST OF ABBREVIATIONS USED

(In alphabetical order)

A	-	Airtraq
AI	-	After intubation
ASA	-	American Society of Anaesthesiologist
bpm	-	Beats per minute
C6	-	6^{th} cervical vertebra
cc	-	Contingency coefficient
CLG	-	Cormack and Lehane grading
cm	-	Centimetre
DBP	-	Diastolic blood pressure
ECG	-	Electrocardiography
EOI	-	Ease of insertion
ETT	-	Endo tracheal tube
I	-	Intubation
IDS	-	Intubation difficulty score
ILMA	-	Intubating laryngeal mask airway

Kg	-	Kilogram
LT	-	Laryngoscopy time
M	-	McCoy
MAP	-	Mean arterial pressure
MILS	-	Manual inline stabilisation
Min	-	Minute
mmHg	-	Millimeter of mercury
MPC	-	Mallampati classification
NIBP	-	Non invasive blood pressure
PI	-	Prior to intubation
SBP	-	Systolic blood pressure
Sec	-	Seconds
TTI	-	Time to intubate
%	-	Percentage
V’	-	First division of trigeminal nerve
V”	-	Second division of trigeminal nerve

ABSTRACT

BACKGROUND

Laryngoscopy and endotracheal intubation forms an important step in administration of general anaesthesia. Method of laryngoscopy can be direct or indirect, ranging from simple rigid scopy with light bulb to complex fiberoptic video scopies.

Airtraq optical laryngoscope is a rigid indirect laryngoscope which helps in visualisation of glottis without the need for aligning the three airway axes namely the oral, pharyngeal and laryngeal with minimal haemodynamic alterations. Since its introduction, it has been studied in the operating room under normal and difficult intubation scenarios and compared with other laryngoscopes.

AIM

This study was conducted to compare McCoy and Airtraq laryngoscopes in efficacy of laryngoscopy, intubating condition, haemodynamic stability and airway trauma in patients at reduced risk of difficult intubation.

METHODOLOGY

60 ASA physical status I & II patients of either sex, aged 20 – 60 years, with normal BMI & airway scheduled for various elective surgical procedures requiring tracheal intubation and general anaesthesia were included in the study. Patients were randomly allocated into two groups Group M (n = 30) & Group A (n = 30). Induction of anaesthesia was standardised. Efficacy of laryngoscopy, intubating condition, haemodynamic stability and airway trauma were compared between the two groups.

RESULTS

The ease of insertion (EOI) of laryngoscope was better with the McCoy laryngoscope when compared to the Airtraq laryngoscope.

Cormack and Lehane grading (CLG) and Intubation difficulty score (IDS) was better with the Airtraq laryngoscope than with the McCoy laryngoscope.

Laryngoscopy time (LT) and Time to intubate (TTI) was longer with the Airtraq laryngoscope when compared with the McCoy laryngoscope.

The increase in mean heart rate and mean arterial pressure during and after intubation were found to be statistically significant between the two groups and found to be more with the McCoy laryngoscope when compared to the Airtraq laryngoscope. Both the Airtraq and the McCoy laryngoscope resulted in equal incidence of airway trauma.

CONCLUSION

Airtraq optical laryngoscope provides a better glottic view and intubating condition with minimal haemodynamic alteration, however with the longer laryngoscopy and intubation time when compared to McCoy laryngoscope.

KEY WORDS

Airtraq optical laryngoscope, McCoy laryngoscope, Laryngoscopy, Intubation.

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INTRODUCTION

Laryngoscopy and endotracheal intubation forms an important step in administration of general anesthesia. Method of laryngoscopy ranges from direct to indirect, from simple rigid scope with light bulb to complex fibreoptic video scopies to ease the process of laryngoscopy and intubation.[1]

The process of laryngoscopy is known to be associated with profound cardiovascular effects. Stimulation of supraglottic region by laryngoscopic blade produces sympathoadrenal response resulting in increased level of catecholamines, mainly norepinephrine. This could cause a transient hypertension and tachycardia which are probably of no consequences in healthy individuals, but found to be hazardous in those with preexisting hypertension, myocardial insufficiency or cerebrovascular diseases ending up in serious complications like myocardial ischemia, cardiac failure, intracranial haemorrhage and increased intracranial pressure.[2,3,4,5]

The McCoy blade laryngoscope was introduced in the nineties and has a hinge on the tip to avoid the lifting force in the vallecula thereby lowering the haemodynamic response related to laryngoscopy and tracheal intubation compared to the routinely used Macintosh laryngoscopes.[6,7]

Success of conventional direct laryngoscopy depends on proper alignment of the airway axes namely the oral, pharyngeal and laryngeal which is achieved by the ‘sniffing position’ where there is a slight flexion of 25 – 35^0 at lower cervical spine and extention of 85^0 at atlantooccipital joint.[8,9]

Direct laryngoscopy cannot provide a good laryngeal view in some patients. Various optical devices have been designed to get a good glottic view and hence facilitate endotracheal intubation without the need to distort normal airway anatomy with additional advantage of lowering the haemodynamic instability.

The Airtraq optical laryngoscope (Prodol Meditec S.A., Vicaya, Spain) is a rigid indirect laryngoscope which can be used for routine endotracheal intubation as well as in patients with difficult airways. It is anatomically shaped and contains two side by side channels, one with series of lenses and prisms and other for the placement of endotracheal tube, a built in antifog system and a low temperature light[10] and helps in visualisation of glottis without the need for alignment of oral, pharyngeal and laryngeal axes.[11]

An ideal laryngoscopic technique should give a good glottic view, facilitate easy intubation with minimal haemodynamic alterations and airway complications.

History

HISTORY

In 1543, Vesalius used a reed via the trachea of animal to prevent lung collapse secondary to pneumothorax.[12]

In 1858, John Snow was the first person to describe placement of a tube into trachea through a surgical incision in order to anaesthetize rabbits.[13]

In 1880, William McEwen of Glasgow passed a tube from the mouth into trachea, using his fingers as a guide in the conscious patient.[14]

In April 23rd 1895, Alfred Kirstein of Germany first described direct visualisation of the human vocal cords.[15] Kirstein learned from his colleague that scope intended for oesophagus of a patient had accidentally slipped into the trachea. This gave Kirstein the idea of developing a tool specifically designed for laryngoscopy and thus invented the world's first laryngoscope. He named the device an "Autoscope". It was an L-shaped instrument, similar to today's version except that the 'blade' portion was a tube and was attached to a power source by electrical wires. Kirstein used his subject's upper teeth as a fulcrum while attempting to expose the larynx by consistently depressing the tongue and passing the autoscope just beyond the epiglottis. Since it produced considerable amount of trauma to upper lip and teeth, Kirstein later modified it, changing the general shape from a ‘rigid tube’ to a ‘straight blade’. Kirstein found that apart from minimizing injury to the upper mouth, it also reduced the degree of neck extension needed. This made him the first person to fully describe what is now commonly referred to as the “sniffing” position.[16]

In 1913, Chevalier Jackson described the technique of direct laryngoscopy to facilitate insertion of endotrachel tubes using his own laryngoscope design. Jackson’s laryngoscope was U-shaped allowing an extra handle for manipulation. The viewing portion itself was straight with proximal tubular section that could be converted to a C-shape by the removal of a side panel.[17] Like the autoscope, this too had disadvantage of having external power source by means of wires. Janeway improved the overall design of both Kirstein and Jackson by designing an L-shaped laryngoscope with a light source powered by batteries in the handle.[18]However, it had the similar problem of producing trauma to upper mouth.[19]

In 1941, Robert Miller made several changes in order to increase the simplicity, ease of direct laryngoscopy and endotracheal intubation and described a modified straight laryngoscope blade. Miller made proximal end of his blade shallow. However the lumen was still large enough to facilitate passage of endotracheal tube. It was also designed to be longer and narrower than the other blades, with the distal half being gently curved to facilitate elevation of epiglottis.[20]

In 1943, Robert Macintosh first described the curved laryngoscope blade, after seeing the Boyle Davis mouth gag used for tonsillectomies. Since its introduction, it has become the most popular throughout the world. Macintosh designed a flange along the left side of the blade to lateralise the tongue which also provided more room for endotracheal tube manipulation. This converted the classical C-shape configuration into an inverted Z- shape. Later, though various modifications have been developed, like the standard Macintosh, classical Macintosh, and English Macintosh, all were designed to elevate the tongue and epiglottis simultaneously with the distal tip being placed within the vallecula.[21]

McCoy blade laryngoscope was developed in nineties with hinge at the tip which can be flexed using a lever adjacent to the handle. The lever can control the tip-of-the-blade angle through 70^0 and improves the glottis view by one grade of Cormack and Lehane's thus helping in difficult intubation scenarios.[22] Moreover by avoiding excess lifting force, it is theoretically believed to lower haemodynamic response related to laryngoscopy and tracheal intubation.

ANATOMY AND PHYSIOLOGY OF THE UPPER AIRWAY

The respiration normally involves a well developed neurophsiological process that enables in the exchange of air by inspiration and expiration through well adapted structures. A clear understanding of the anatomy is necessary for maintenance of airway or to re-establish the normal airway which extends from the nostrils to the terminal alveoli.

NOSE

The external nose is formed by nasal bones, a series of cartilages in the lower part, cartilaginous portion of nasal septum and the skin. The pliable portion of the nasal septum and columella seperates the paired elliptical nostrils. The upper bony framework is composed of the two nasal bones and the bones that form the posterior septum: the vomer (inferiorly) and the perpendicular plate of ethmoid (superiorly).

The nasal cavity is divided by the nasal septum into two passages that open to the exterior by the nares and into the nasopharynx by posterior nasal apertures or choanae. Vestibule is a small dilated part located directly above each. The skin of the vestibule is thin and tightly adherent to the underlying lower lateral cartilages and lined by stiff, straight hairs (vibrissae) that assist in air filtration.

Each nasal fossa presents a roof, a floor, a medial wall and a lateral wall.

The roof is formed by the nasal and frontal bones forming the nasal bridge, the cribriform plate of the ethmoid forming the horizontal part and the body of the sphenoid forming the downward – sloping segment.

The floor is formed by the palatine process of maxilla and the horizontal plate of the palatine bone.

The medial wall is the nasal septum, formed by the septal cartilage, the perpendicular plate of the ethmoid and the vomer. Septal deviation are present to some degree in about 75% of the adults.

The lateral walls of the nasal passages are composed of irregular bony elavations covered by soft tissue and mucous membrane and are termed as the inferior, middle, superior and supreme nasal conchae or turbinates. The space beneath each concha is called a meatus. The supreme, superior and middle conchae are formed from the medial part of the ethmoid labyrinth, while the inferior concha is a separate bone. The orifices of the paranasal sinuses and the nasolacrimal duct opens onto the lateral wall.

The inferior meatus which lies inferior to the inferior turbinate has opening of nasolacrimal ducts. The middle meatus which lies between the inferior and middle turbinates contains the ostia of the nasofrontal duct, the anterior ethmoid cells and the maxillary sinus.

The superior meatus which lies superior to the middle turbinate contains the opening of posterior ethmoid cells. The sphenoid ostium lies on the anterior wall of the sphenoid sinus in the area of the sphenoethmoidal recess.

Each posterior naris or choana is oval and measures approximately 2.5 cm vertically and 1.5 cm horizontally. Congenital choanal atresia and post-traumatic bony septal deviations can pose serious problems by producing obstruction posteriorly.

BLOOD SUPPLY

The arterial supply for the upper part of the nasal cavity is from the anterior and posterior ethmoidal branches of the ophthalmic artery which is a branch of internal carotid artery.

The lower part of the cavity receives its arterial supply from the sphenopalatine branch of the maxillary artery and anastamose with the the superior labial branch of the facial artery on the antero-inferior part of the septum forming Little’s area which is the common site for epistaxis.

Venous drainage is into the sphenopalatine, facial and ophthalmic veins and communicates with the cavernous sinus .

The rich vascular supply of the turbinates allows the nasal airway to expand or contract according to the degree of vascular engorgement. Trauma to the nasal passage may result in profuse haemorrhage because of their rich blood supply.

NERVE SUPPLY

The olfactory zone is supplied by the olfactory nerve (I)

The nasociliary branch of the 1^{st} division of trigeminal nerve (V’) forms the nerve of common sensation along with contribution from the 2^{nd} division(V”).

The main part of septum is supplied by the nasopalatine nerve which is derived from the 2^{nd} division (V”) via the pterygopalatine ganglion, postero-superior corner by the branches of the medial postero-superior nasal nerve and the anterior part by the septal branches of the anterior ethmoidal nerve.

The upper part of lateral wall is innervated in by the lateral posterior superior nasal nerve, while the inferior concha by the anterior superior alveolar nerve and the anterior palatine nerve.

The floor is supplied by antero-superior alveolar nerve anteriorly and greater palatine nerve posteriorly.

The vestibule is supplied by the terminal branches of the infra-orbital branch of the maxillary nerve.

The paranasal sinuses are innervated by V’ and V”.

FUNCTIONS OF THE NOSE

The nose forms the respiratory pathway, through which air is warmed, humidified and filtered. Other two important functions are olfaction and phonation

THE PHARYNX

The pharynx is a wide musculofacial tube connecting the nasal and oral cavities with the larynx and oesophagusextending that extend from the basilar part of the occipital bone to 6th cervical vertebra (C6). It communicates anteriorly with the nasal cavity forming the nasopharynx, with oral cavity forming the oropharynx and with larynx forming laryngopharynx.

NASOPHARYNX

The nasopharynx is situated directly behind the nasal cavity and just above the soft palate. The act of swallowing closes off its communication with the oropharynx through pharyngeal isthmus.

The pharyngeal end of the pharyngotypanic tube opens 1cm behind and below the inferior nasal concha on the lateral wall of the nasopharynx. A bulge situated immediately behind its opening formed by the underlying cartilage of the tube forms the tubal elevation and behind which lies a small depression, the pharyngeal recess-fossa of Rosenmuller.

The nasopharyngeal tonsil (adenoids) containing the collection of lymphoid tissues is situated on the roof and posterior wall of the nasopharynx and starts to atrophy around the time of puberty. Postero-superior to the nasopharynx lies the sphenoid sinus separating the pharynx from the sella turcica containing the pituitary gland.

OROPHARYNX

The oropharynx is located directly behind the oral cavity extending from the soft palate above to the tip of the epiglottis below. The posterior wall consists of the prevertebral fascia and the bodies of the second and third cervical vertebrae. The lateral walls of the oropharynx contain the paired tonsillar fossae.These fossae are formed by the palatoglossal and palatopharyngeal folds and contain the palatine tonsils.

The base of the tongue lie directly medial to the tonsillar fauces and attaches to the epiglottis by the paired lateral glossoepigottic folds and by the single median glossoepiglottic fold which forms two spaces, the epiglottic valleculae. The posterior dorsal tongue has lingual tonsils.

The tongue musculature is divided into two groups – muscles that are attached to fixed points (styloglossus, genioglossus, hyoglossus and palatoglossus) and muscles that run freely in the body of the tongue (transverse, superior and inferior longitudinal muscles and vertical muscles). The paired mylohyoid muscles which arise from the mandible and insert into the hyoid bone forms the major support to the floor of mouth.

LARYNGOPHARYNX (HYPOPHARYNX)

The laryngopharynx extends inferiorly from the tip of the epiglottis to the lower border of the cricoid cartilage at the level of C6 and communicates with the oropharynx, the laryngeal inlet and the oesophagus. The funnel- shaped piriform recesses are found on either side of the larynx and lie between the aryepiglottic folds and the internal lining of the thyroid cartilage. The posterior border of the hypopharynx comprises of the buccopharyngeal and prevertebral fascia and deep prevertebral musculature.

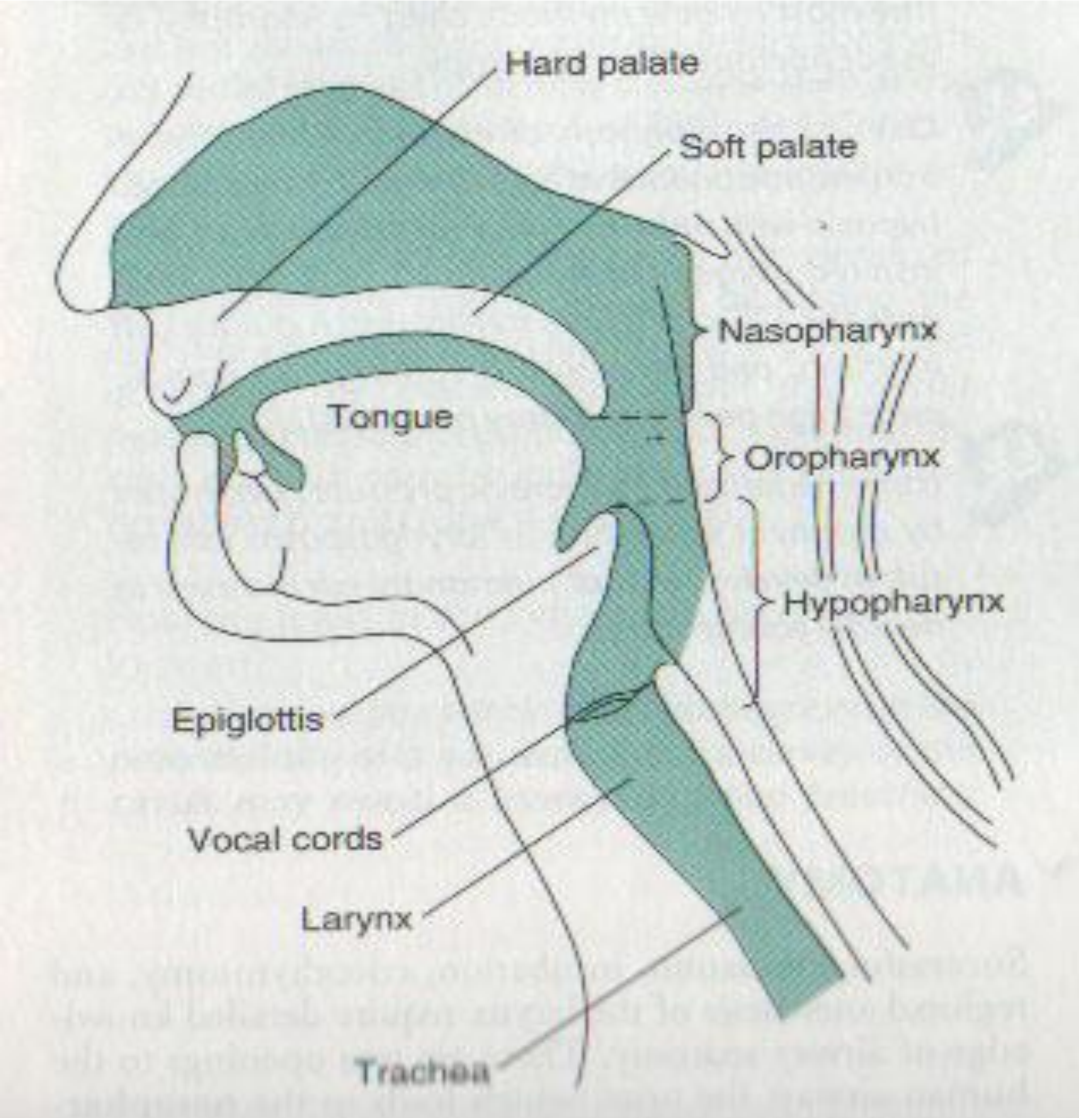


Fig. 1

ANATOMY OF THE UPPER AIRWAY

MUSCLES OF PHARYNX

The muscles of the pharynx are the superior, middle and inferior constrictors, the stylopharyngeus, salpingopharyngeus and palatopharyngeus. The superior constrictor inserts at the base of the skull, the middle constrictor into the hyoid bone and the inferior constrictor muscle into the cricoid cartilage. The inferior constrictor contributes to a muscular band, the cricopharyngeus forming the upper oesophageal sphincter. All the muscles are inserted posteriorly into a tendinous median raphe.

BLOOD SUPPLY

Arterial supply

- Tonsillar branch of the facial artery
- Lingual artery
- Ascending palatine artery
- Ascending pharyngeal artery
- Maxillary artery

Venous drainage

Facial vein and paratonsillar vein into the pharyngeal venous plexus.

NERVE SUPPLY

The sensory supply is by the glossopharyngeal nerve, the posterior palatine branch of the maxillary nerve and lingual branch of the mandibular nerve.

THE LARYNX

The larynx comprises of three unpaired cartilages namely thyroid, cricoid and epiglottis and three paired cartilages namely arytenoids, corniculate and cuneiform.Thyroid cartilage, cricoid cartilage and hyoid bone form the laryngeal skeleton.

THYROID CARTILAGE

The shield-like thyroid cartilage consists of two laminae meeting in the midline inferiorly and forming thyroid notch above. This junction is prominent in males forming what is known as Adam's apple. The laminae has superior and inferior horns. The inferior horn articulates with the cricoid cartilage below.

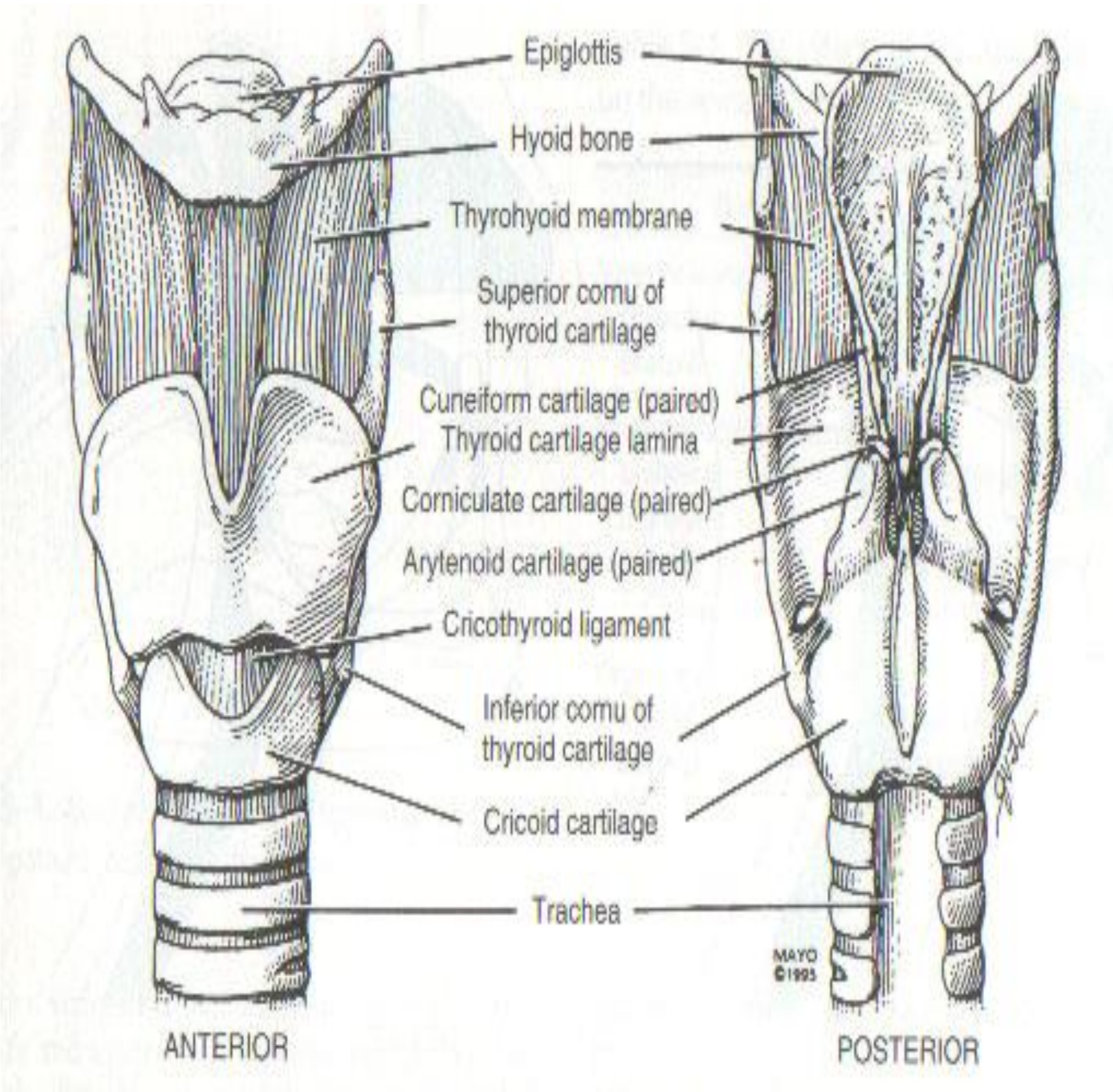


Fig. 2

THE LARYNX

CRICOID CARTILAGE

The cricoid cartilage is the only complete ring in the larynx forming a signet ring shape with anterior part measuring 5 to 7 mm in height, while the posterior part measuring 2 to 3 cm in height. It has two surfaces that articulates with the thyroid cartilage.

EPIGLOTTIS AND ARYTENOID CARTILAGES

The epiglottis is a leaf shaped cartilage forming the anterior border of the laryngeal inlet and helps in protecting airway during deglutition. It is attached to the hyoid bone and thyroid cartilage by several ligaments. The mucous membrane covering sweeps forward centrally onto the tongue and on either side onto the sidewalls of the oropharynx, to form the median and the lateral glosso-epigottic folds respectively.

The valleys on either side of the median gloss-epiglottic fold are known as the valleculae.The arytenoid cartilages are pyramid shaped and articulates with posterior aspects of the cricoid cartilage. The muscular processes are attached to the cricoarytenoid muscles and the anterior vocal process to vocal ligament. Movement of the cricoarytenoid joint from the action of the laryngeal muscles causes a change in size of the opening between the vocal cords.

VOCAL CORDS

The vocal cords are also called the true vocal cords or vocal folds, extending from the arytenoid cartilages posteriorly to the thyroid cartilage anteriorly. The laryngeal aditus which forms the entrance of the laryngeal cavity, leads to the vestibule, which in turn leads to the rima vestibuli. The two mucosal folds that are parallel and above the vocal cords binding the rima vestibuli are called the ventricular folds or false vocal cords. The rima glottidis is the lateral space between the ventricular and vocal folds and the name glottis refers to the rima glottidis and the adjacent true vocal cords. The subglottic region refers to the space that leads from the rima glottidis to the trachea.

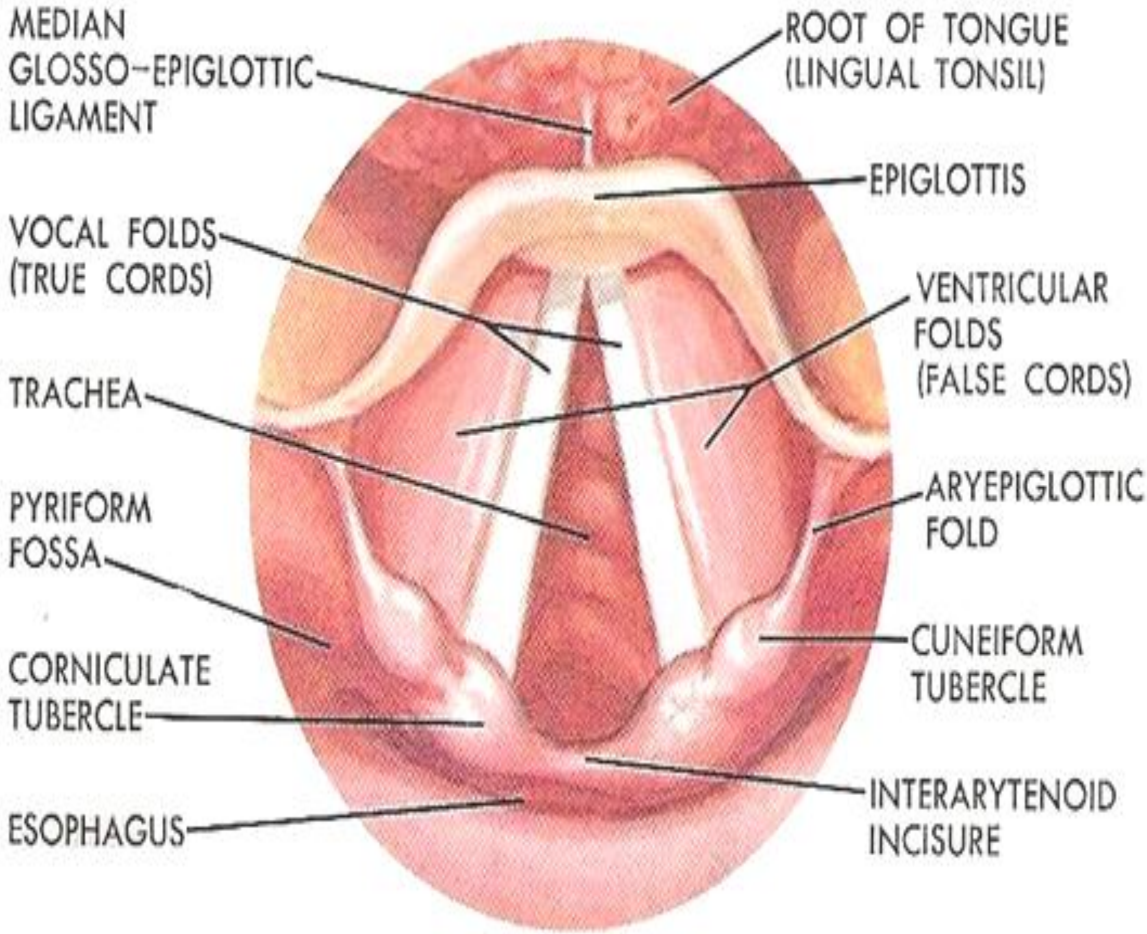


Fig. 3

THE GLOTTIS

MUSCLES OF THE LARYNX

Intrinsic muscles of the larynx include the posterior cricoarytenoid and lateral cricoarytenoids, transverse arytenoid, oblique arytenoids, the thyroarytenoid, the ary and thyroepiglottic, the vocalis and the cricothyroid muscles.

Extrinsic muscles of the larynx include the sternothyroid, the thyrohyoid and the inferior constrictor of the pharynx.

FUNCTIONS OF INTRINSIC MUSCLES OF LARYNX

Muscles	Functions
Posterior cricoarytenoid	Abductors of vocal cords
Lateral cricoarytenoid	Adductors of vocal cord
Transverse arytenoids	Adductors of vocal cord
Oblique arytenoids	Closes glottis
Vocalis	Relaxes vocal cord
Thyroarytenoid	Relaxes vocal cord
Cricothyroid	Tensor of vocal cords

BLOOD SUPPLY AND VENOUS DRAINAGE OF THE LARYNX

- Upto the vocal cords:
    - arterial supply - the superior laryngeal artery, a branch of superior thyroid artery.
    - venous drainage - the superior laryngeal vein drains into superior thyroid vein.
- Below the vocal cords:
    - arterial supply - the inferior laryngeal artery, a branch of inferior thyroid artery.
    - venous drainage - the inferior laryngeal vein drains into inferior thyroid vein.

NERVE SUPPLY OF THE LARYNX

The superior laryngeal nerve which is a branch of vagus nerve, divides into internal and external laryngeal nerves. The internal laryngeal nerve gives sensory supply to the interiors of the larynx down to the level of the vocal cords. The external laryngeal nerve sends motor fibers to the cricothyroid muscles.

The recurrent laryngeal nerve leaves the vagus at the level of right subclavian artery on the right side and at the level of aortic arch on the left side. It supplies all the intrinsic muscles of larynx except the cricothyroid and sends sensory fibres to the laryngeal mucosa inferior to the vocal cords.

Both the laryngeal nerves form anastamotic links with the cardiac and aortic plexus in their early course contributing to the cardiovascular responses associated with laryngoscopy and endotracheal intubation.

FUNCTIONS OF THE LARYNX

- The sphincteric protective function prevents food, liquid and other foreign materials from entering the lower airway.
- The vibratory effect on the expiratory air column helps in voice production.[23,24,25,26]

MALLAMPATI CLASS

Mallampatti test is probably the most commonly employed test for predicting airway management difficulty. It indicates the amount of space within the oral cavity to accommodate the laryngoscope and endotracheal tube. This is performed by having the patient open the mouth as wide as possible and stick out the tongue without phonation such as “aah” which lowers the grade by one step. One should also ensure that the patient is in the sitting position with the head protruding forward, mimicking the “sniffing” position for laryngoscopy and intubation. The observer’s eye should be at the level of patient’s open mouth and observe the degree to which faucial pillars, uvula, soft palate and the hard palate are visible.

The original MPC had 3 grades. Samsoon and Young modified Mallampati grading to 4 grades.[27,28] As per latest modification of Mallampati grading, following 5 grades may be noted:

Class 0: Tip of the epiglottis visible

Class I: Faucial pillars, uvula, soft and hard palate visible

Class II: Uvula, soft and hard palate visible

Class III: Soft and hard palate visible

Class IV: Only hard palate visible

Class III & IV can result in difficult intubation. When used in isolation the Mallampati test predicts approximately about 50% of difficult intubation

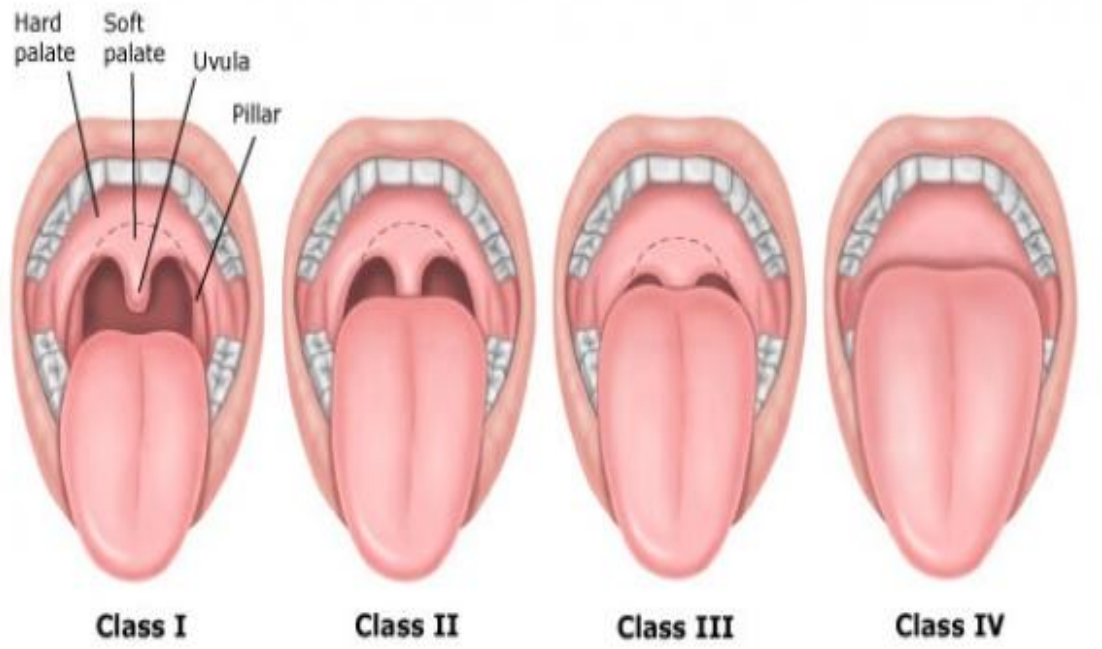


Fig. 4

MALLAMPATI CLASSIFICATION

Record of other parameters like Temporomandibular joint (TMJ) function, Upper lip bite test, Neck movement, Neck circumference, Thyromental distance and Sternomental distance along with mallampati test enhances the sensitivity of predicting difficult laryngoscopy and intubation.

TEMPOROMANDIBULAR JOINT (TMJ) FUNCTION

- Rotational movement is responsible for the initial 2-3 cm mouth opening
- Forward displacement is responsible for the further 2-3 cm mouth opening. The temporomandibular joint function can be tested by asking the patient to open his mouth wide open and place his three fingers (index, middle and ring) in the opening. If done, this is >5 cm and is adequate for direct laryngoscopy.

UPPER LIP BITE TEST

Upper lip bite test is used to test the mandibular movement function and the architecture of the teeth.

Class I: Lower incisors can bite the upper lip above the vermilion line.

Class II: Lower incisors can bite the upper lip below the vermilion line.

Class III: Lower incisors cannot bite the upper lip.

NECK MOVEMENT

Normal head and neck movement includes an extension $>85^0$, flexion >25- 30^0, rotation >70-75^0. Laryngoscopic view becomes easier in the “sniffing” position which involes flexion (25-35^0) at the lower cervical spine level and extention (85^0) at the atlanto-occipital joint.

The neck flexion is assessed by asking the patient to touch his manubrium sterni with his chin and the neck extension is assessed by asking the patient to look at the ceiling without raising eyebrows.

THYROMENTAL DISTANCE

This is the distance between the thyroid notch and mental symphysis when the neck is fully extended.

>6.5 cm: No problem with laryngoscopy and intubation.

6.0 - 6.5 cm: Without other concomitant anatomical problems, laryngoscopy and intubation are difficult but possible.

<6.0 cm: Laryngoscopy may be impossible.

STERNOMENTAL DISTANCE

This is measured with head in full extension and mouth closed. A sternomental distance of <12.5 cm predicts difficult laryngoscopic intubation.

CORMACK AND LEHANE CLASSIFICATION

Cormack and Lehane classification helps in assessing the quality of glottic view during laryngoscopy and intubation.

Grade I: Visualisation of entire vocal cords.

Grade II: Visualisation of posterior part of the laryngeal aperture.

Grade III: Visualisation of epiglottis.

Grade IV: No glottic structures seen.

Cook (1999) has further subdivided Cormack and Lehane's Grade II and III as IIa, IIb, IIIa, IIIb where

IIa - visualisation of posterior part of vocal cord.

IIb - visualisation of arytenoids only.

IIIa - epiglottis liftable.

IIIb - epiglottis adherent or only tip visible.[29]

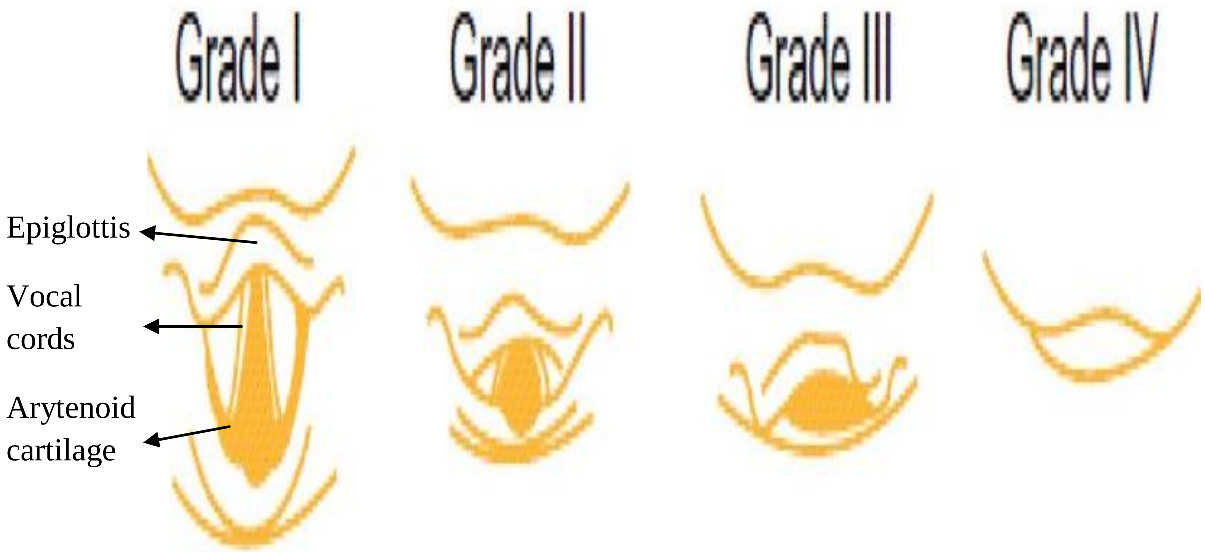


Fig. 5

CORMACK AND LEHANE GRADING

LIKERT SCALE FOR INSERTION OF AIRTRAQ

Very difficult : -2

Difficult : -1

Neutral : 0

Easy : 1

Very easy : 2

MODIFIED INTUBATION DIFFICULTY SCORE

IDS Component	Laryngoscope	Airtraq
N1	Number of intubation attempts>1	Number of intubation attempts>1
N2	The number of operators>1	The number of operators>1
N3	Number of alternative intubation techniques used	Number of alternative intubation techniques used Bougie used: 1
N4	Glottic exposure (Cormack and Lehane grade−1)	Glottic exposure (Cormack and Lehane grade−1)
N5	Lifting force required during laryngoscopy Normal: 0 Increased: 1	Lifting force required during laryngoscopy Normal: 0 Increased or change in position of Airtraq required: 1
N6	Necessity for external laryngeal pressure	Necessity for external laryngeal pressure
N7	Position of the vocal cords at intubation Abduction/not visualized: 0 Adduction: 1	Position of the vocal cords at intubation Abduction/not visualized: 0 Adduction: 1[30]

LARYNGOSCOPES

Laryngoscopes are the tools used for endotrcaheal intubation. Apart from this, they are also used for placement of gastric tube and transesophageal echocardiac probe, upper airway assessment and removal of foreign body and range from simple rigid scopes with light bulb to complex fiberoptic video devices.

Description

Rigid laryngoscopes are designed either as a single-piece or a separate detachable handle and blade where light source is either a lamp attached to the blade or a lamp in the handle with a light guide in the blade. In the detachable handle and blade model, the light source is energised when the handle and blade are in locked operating position. A hook-on type of connection is most commonly used between handle and blade.

Handle

The handle is the part, which the operator holds in the hand while using and contains batteries which acts as the power source. Both disposable and rechargeable batteries are available. Handles that are designed to accept blades that have a light bulb have metallic contact, which completes an electrical circuit when handle and blade are in locked position. When handle and blade are in locked operating position, an activator switch is depressed, connecting the bulb and the batteries.

Fiberoptic illuminated laryngoscopy have halogen lamp bulb in their handle. Handles are available in several sizes. Short and stubby handles are useful in whom the chest and/or breasts contact the handle during use, when is in body cast, or while applying cricoid pressure. Smaller handles are useful for paediatric patients.

Blade

The blade is the part that is inserted into the mouth. They are available in various sizes and numbered accordingly. Disposable blades are also available. Parts of the blade include base, heel, tongue, flange, web, tip and light source. The base is the part that attaches to the handle with a slot for the handle's hinge pin. The end of base forms the heel.

The tongue or the spatula forms the main shaft that serves to compress and manipulate the soft tissues (especially the tongue) and lower jaw. The long axis of the tongue may be straight or curved in part or its entire length based on which they are named as curved or straight.

In general, straight blades provide better laryngeal view and curved blades make intubation easier. A bougie or a stylet may be useful in situations where view is satisfactory but intubation is difficult.

The flange is the lateral projection from the tongue and connected to it by the web. It helps in lateralisation of tongue and soft tissues from the line of vision. The cross-sectional shape of the blade is determined by the flange and the vertical height of the cross-sectional shape of blade is termed as the step.

The tip is the part that contacts either the epiglottis or the vallecula and helps in elevating the epiglottis directly or indirectly. It is usually blunt and thickened to reduce trauma.

The blade may have a bulb or a fiberoptic bundle that transmits light from a source in the handle. The lamp screws into a socket that has a metallic contact. The socket is usually located near the tip and can get soiled by fluids that can affect the electrical contacts, resulting in bulb failure.

In most cases, using a laryngoscopy presents little or no difficulty in experienced hands as the skill is of more importance than the type of blade employed. There are, however, situations where certain modifications of blade are particularly advantageous. This resulted in the development of various types of blades.

Macintosh Blade

The Macintosh is one of the most commonly used blades which have a gentle curved tongue extending to the tip. The tongue, web and flange form a reverse Z configuration. The no.3 and no.4 size blades are more commonly used for adults.

Flexible-tip Blades

The flexible-tip blades have hinged tip that can be controlled by a lever attached to the proximal part of the blade. The blade tip can be flexed by pushing the lever towards the handle. They are available under various names, including McCoy, Flipper, Flex tip, levering laryngoscope blade and articulating laryngoscope blade. The tip is less rounded than that of the usual Macintosh blade.

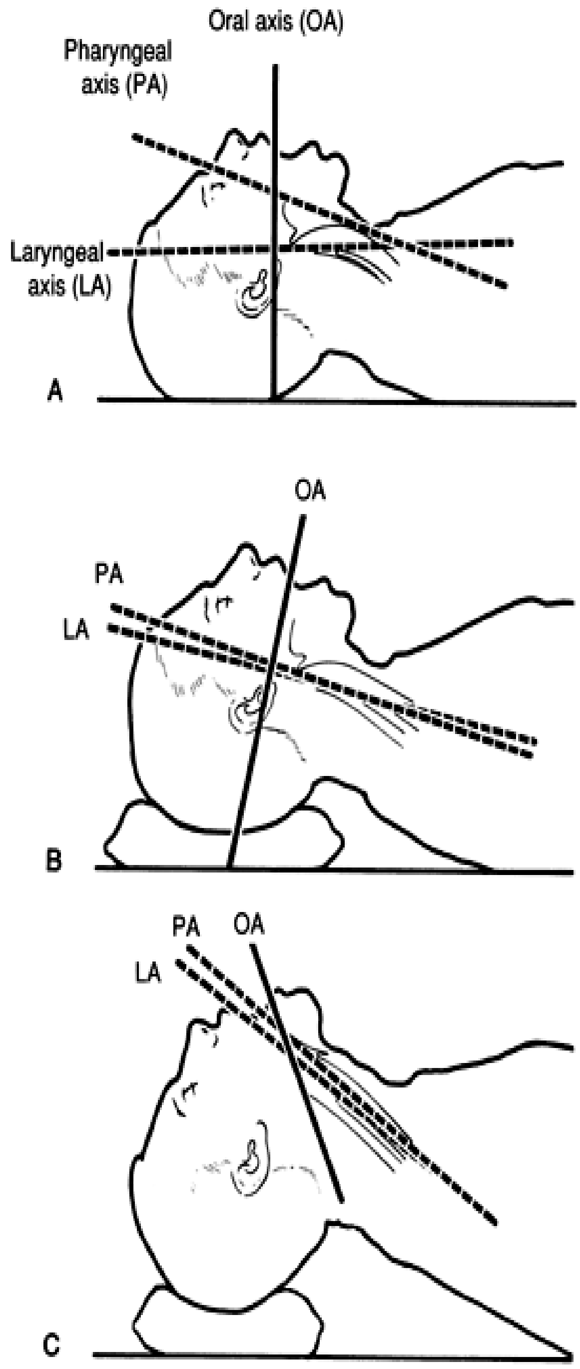
The flexible tip blade may be helpful in a difficult intubation scenario and in patients with restricted neck movement. Studies have been conducted to compare it with Macintosh to show that it resulted in less stress response by significantly reducing the lifting force required.

Techniques of Use

The technique of conventional laryngoscopy usually needs optimal positioning of the patient with 25^0-35^0 flexion at the lower cervical spine and 85^0-95^0 extension at the atlanto-occipital junction, which is referred to as the “sniffing” position. The flexion at the lower cervical spine can be achieved by a head elevation of 8-10 cm, as on a pillow or doughnut. This is usually not needed in paediatric age groups, while elevation of the shoulders may be necessary in neonates because of the relatively larger size of the head.

The extension at atlanto-occipital junction is achieved by applying pressure on the top of the head and/or upward traction on the upper teeth or gums.

The laryngoscopy handle is held in the gloved left hand, while the fingers of the right hand are used to open the mouth widely. In patients with dentition, adequate mouth opening is usually achieved with a thumb-over-index finger approach, with the index finger on the maxillary teeth and the thumb over the lower teeth. The blade is inserted at the right side of the mouth to avoid damage to the incisor teeth and to push the tongue to the left. Then it is advanced along the side of the tongue toward the right tonsillar fossa to lateralise the tongue to left side, while the right hand keeps the lips from getting caught between the teeth or gums and the blade. The blade is then advanced behind the base of the tongue, elevating it, until the epiglottis is visible, which is then elevated directly or indirectly depending on the type of blade being used.



Neutral position

Flexion

Extension

Fig. 6

AIRWAY AXES

Straight Blade Technique

The straight blade is made to scoop under the epiglottis and lift it anteriorly to expose the vocal cord. Too far advancement will tend to elevate the larynx as a whole, or occasionally will expose the oesophagus. It should then be withdrawn slowly, as too far withdrawal will tend to release the tip of the epiglottis and flip over the glottis. A straight blade can also be placed in the vallecula and used in the same manner as a curved blade.

Curved Blade Technique

After the epiglottis is visualised, the blade is further advanced until its tip fits into the vallecula. Traction is then applied along the direction of the handle at right angles to the blade to move the base of the tongue resulting in indirect elevation of the epiglottis to expose the glottis. Backward pulling of the handle opposite the blade should be avoided as it will cause the tip to push the larynx upward and out of sight and produce damage to upper mouth.[31]

McCoy Blade Technique

The McCoy blade is used in the same way as the regular Macintosh curved blade, except that after placing the tip of the blade into the vallecula, it could be flexed using a lever adjacent to the handle as the tongue and the pharyngeal soft tissues are lifted to expose the glottis opening. The lever can control the tip-of-the-blade angle through 70^0. This usually improves the glottic view by one grade of Cormack and Lehane's and found to be useful in difficult intubation situations.

Fig. 7

The McCoy blade (size 3 & 4)

Fig. 8

The McCoy laryngoscope

Airtraq Optical Laryngoscope

The Airtraq (Prodol Meditec S.A.,Vizcaya, Spain) is a new intubation aid that has been designed to facilitate endotracheal intubation in patients with normal as well as difficult airways.

The preformed curvature of the blade and an internal arrangement of optical components help in visualisation of glottis without the need for aligning the 3 airway axes namely the oral, pharyngeal and tracheal.

It has two side-by-side channels, one acting as a conduit through which an endotracheal tube (ETT) can be passed, whilst the other channel contains a series of lenses, prisms and mirrors to transfer the image from the distal illuminated tip to a proximal viewfinder. The Airtraq is anatomically shaped and available in various sizes to use it with standard ETTs of all sizes. A clip on wireless video system is also available, which allows the view to be screened on an external screen. This may be useful for teaching purposes.

SIZE	COLOUR	SIZE OF ENDOTRACHEAL TUBE	MINIMUM MOUTH OPENING REQUIRED
Regular	Blue	7.0 – 8.5	18mm
Small	Green	6.0 – 7.5	16mm
Paediatric	Purple	4.0 – 5.5	12.5mm
Infant	Grey	2.5 – 3.5	12.5mm

Fig. 9

The Airtraq optical laryngoscope

Technique of endotracheal intubation with the Airtraq Optical Laryngoscope

Preparation

A well lubricated ETT of appropriate size with its cuff fully deflated is preloaded onto the dedicated side channel of Airtraq, which is to be turned on 30-60 sec before, to activate the antifogging system.

The tip of the ETT is aligned with the end of the lateral channel. The ETT Side channel, front and back surface of Airtraq is also lubricated without contacting the lens.

Airtraq intubation

After placing the head in neutral position, Airtraq is inserted into the midline of patient's mouth, over the centre of the tongue. Before the Airtraq reaches the vertical plane, view from the view finder is used to identify the airway structures. Keeping it in the midline, the blade is advanced till its tip is placed in the vallecula and lifted up to expose the glottis. Alternatively, the tip can be placed under the epiglottis, lifting it out of the way.

Adjustment of Airtraq position is needed to align the glottis in the centre of the visual field and then the ETT is advanced until it is visualised passing through the vocal cords.

Proper positioning is checked after inflating the cuff. Now the ETT is separated from the Airtraq by pulling it laterally from the ETT, while holding the ETT in position.[32]

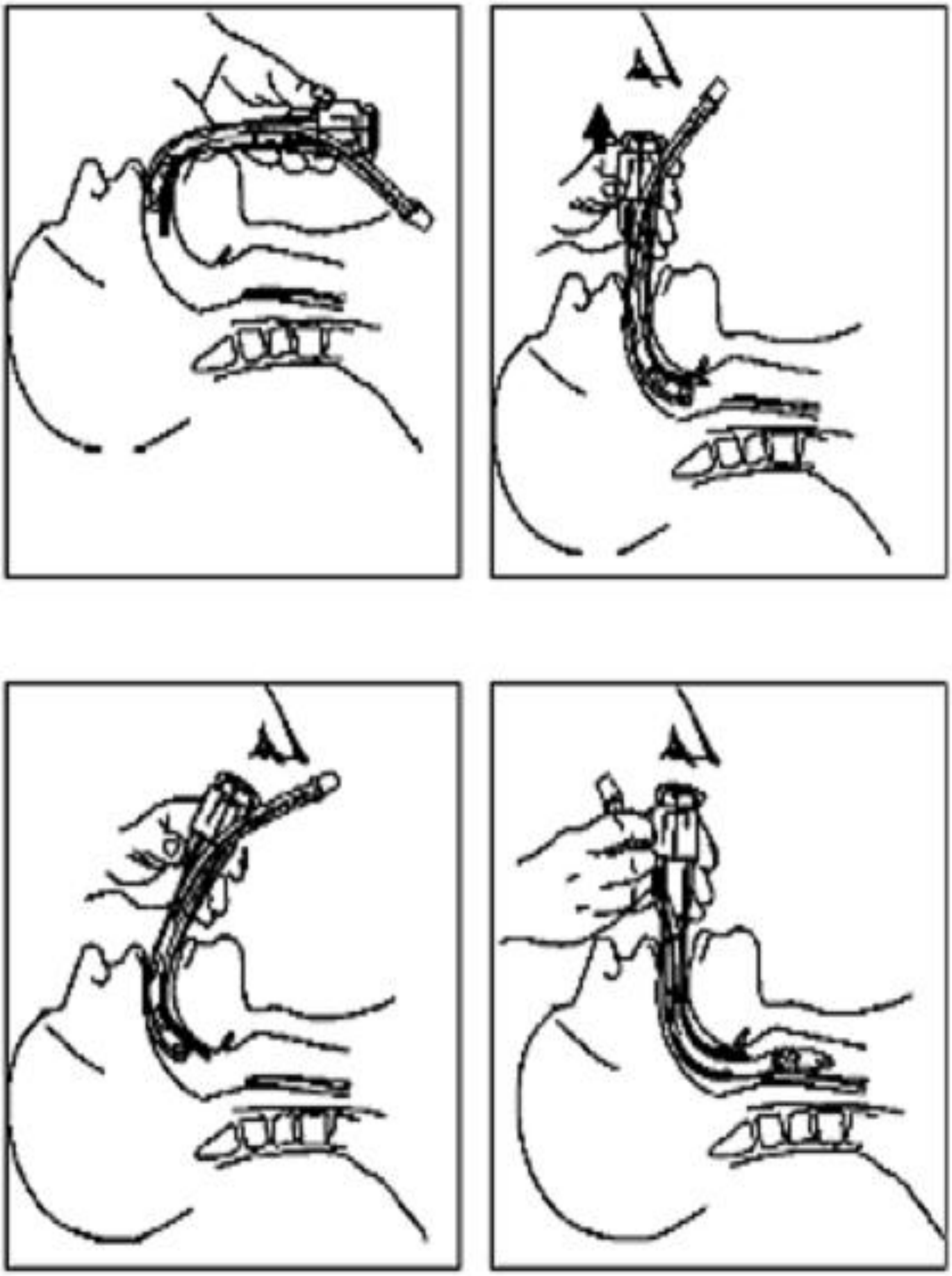


Fig. 10

AIRTRAQ INTUBATION

Aims and Objectives

AIMS AND OBJECTIVES

To compare McCoy and Airtraq laryngoscopes

- In efficacy of laryngoscopy
- Intubating condition
- Haemodynamic stability and
- Traumatic complications

In patients with reduced risk for difficult intubation.

Review of Literature

REVIEW OF LITERATURE

Shribman et al. compared catecholamine level and cardiovascular response following laryngoscopy only with those following a combined laryngoscopy and intubation among 24 patients after randomising them into two groups. Anaesthesia was standardised and after achieving adequate muscle relaxation, laryngoscopy was done to visualise the vocal cords for 10 sec after which ventilation was reinstituted in one group, while tracheal intubation was carried out in the same 10 sec period and lung ventilation maintained in the other group. Parameters like heart rate, arterial pressure and catecholamine level were measured before and after induction and at 1, 3, 5 min following laryngoscopy. They observed a significant and similar increase in arterial pressure and plasma catecholamine level following laryngoscopy with or without intubation. However, a significant increase in heart rate was observed only in intubation group but not in laryngoscopy - only group.[33]

Maharaj et al. conducted a randomized, controlled clinical trial to compare the Airtraq and the Macintosh laryngoscopes on sixty patients at low risk for difficult intubation requiring general anaesthesia by dividing them into two groups: Macintosh group (n = 30) and Airtraq group (n = 30). All but one patient, in Macintosh group were successfully intubated on the first attempt. They observed no difference in duration of intubation in both the groups. Airtraq group showed modest improvement in intubation difficulty score and less haemodynamic alterations compared to Macintosh group.[34]

Maharaj et al. conducted a randomised, controlled clinical trial for comparison of the Airtraq and the Macintosh laryngoscope, in 40 patients at increased risk for difficult intubation requiring surgery under general anaesthesia. Patients were divided into two groups of 20 each and laryngoscopy was carried out by experienced anaesthetists. In their study, four patients who were not successfully intubated with Macintosh laryngoscope were intubated successfully with the Airtraq laryngoscope. Their study showed the Airtraq to be superior to Macintosh laryngoscope as far as the duration of intubation, the need for additional manoeuvres, the intubation difficulty score, haemodynamic stability and airway trauma were concerned.[35]

Tomasz Gaszyński et al. compared the median time taken for intubation between the Airtraq and the Macintosh laryngoscope in 68 obese patients with BMI > 39 posted for elective abdominal surgery. They observed that the time taken for successful endotracheal intubation was only 29 sec in the Airtraq group compared to 49 sec in the Macintosh group. Additional manoeuvres were required to get optimal glottic view among 7 cases in the Airtraq group and an elastic guidewire was used for intubation in difficult cases in the Macintosh group. No traumatic complications were observed in either group.[36]

G.L.Savoldelli et al. did a study to analyse the efficacy of the Macintosh, the Glidescope, the McGrath and the Airtraq laryngoscopes. The study enrolled 60 anaesthesia providers (20 staffs, 20 residents and 20 nurses) and was asked to intubate the trachea of a Laerdal SimMan manikin in three simulated difficult airway scenarios. They found that the indirect laryngoscopes provided better laryngeal view and less dental trauma in all the scenarios, whilst faster intubation with high success rate in most difficult scenarios. However differences existed among them with the Airtraq providing the faster intubation. Also the laryngeal view was superior with the Airtraq and the McGrath than with the Glidescope.[37]

Sherren et al. compared Macintosh, McCoy, Airtraq laryngoscopes and the intubating laryngeal mask airway in a difficult airway with manual in-line stabilisation. It was a cross-over simulation-based study done by 35 experienced airway physicians on Laerdal Sim Man manikin in both Normal airway & Difficult airway scenarios with MILS

Normal airway scenario showed no difference in success rate and duration with all the laryngoscopes.

However in difficult airway scenario, the Airtraq laryngoscope resulted in best glottic view and lowest force of intubation but longer time for intubation. The McCoy laryngoscope provided better glottic view and reduced force of intubation, while the ILMA resulted in fastest intubation time with minimal force.[38]

Arino et al. compared the Airtraq and the McCoy laryngoscopes for endotracheal intubation with respect to laryngoscopic view and the time taken for intubation. The study was a randomized controlled trial conducted on 200 patients by dividing them into two groups of 100 each. Anaesthesia was standardized and intubation was carried out with either of the laryngoscope according to the group they were allocated. They showed that the Airtraq laryngoscope provided better laryngoscopic view than the McCoy laryngoscope but the time taken for intubation was similar in both the groups.[39]

Mehtab A Haidry et al. compared Macintosh and McCoy laryngoscopes with respect to haemodynamic response to endotracheal intubation on 60 patients by randomizing them into two groups equally and found the McCoy laryngoscope to be associated with less haemodynamic alteration compared to the Macintosh laryngoscope.[40]

Padmaja Durga et al. conducted a comparison study between the Airtraq and the McCoy laryngoscopes in the presence of rigid cervical collar simulating cervical immobilisation. The study design was an open-labelled, randomised, cross-over trial carried out on 60 patients. Each was intubated twice, once using the Airtraq laryngoscope and later with the McCoy laryngoscope. Parameters like ease of insertion, glottic view, intubation time, intubation difficulty score were all noted down. Ease of insertion, intubation time, incidence of trauma were all comparable between the two techniques. However the Airtraq showed improved glottic view and intubation difficulty score compared to the McCoy laryngoscope.[41]

Materials & Methods

MATERIALS AND METHODS

DESIGN:

Prospective Randomized study

PARTICIPANTS:

Single anaesthesiologist under supervision of a senior anaesthesiologist & with help of two anaesthesia technicians

CENTRE:

Mahathma Gandhi Memorial Govt. Hospital attached to

K.A.P.Viswanatham Govt. medical college, Trichy.

PERIOD:

Oct 2012 – Aug 2014

SAMPLE SIZE:

Sixty (N=60)

GROUPS:

Group M: Intubation with McCoy laryngoscope (n=30)

Group A: Intubation with Airtraq laryngoscope (n=30)

INCLUSION CRITERIA

- Age 20-60 years
- Male / Female
- BMI 18.5-29.9
- ASA I & II
- MPC I & II
- Elective surgery requiring General anaesthesia via ETT

EXCLUSION CRITERIA

- Age <20 / >60 years
- BMI <18.5 / >29.9
- ASA III & IV
- MPC III & IV
- Emergency surgery
- Airway / Upper gastro intestinal pathology
- Risk of aspiration
- Cervical spine injury

- Raised intra cranial tension
- Known case of Hypertension or Diabetes mellitus

PRE ANAESTHETIC ASSESSMENT

All patients were assessed one day prior to the procedure. General and systemic examinations were carried out. Baseline heart rate, systolic, diastolic, and mean blood pressure were recorded.

Airway assessment was done by noting down the inter incisor distance, presence or absence of buck teeth, neck movement, neck circumference, thyromental distance, sternomental distance, upper lip bite test and mallampati grading.

Routine investigations like complete haemogram, random bood sugar, blood urea, serum creatinine, chest x-ray and electrocardiogram were performed.

After getting Institutional Ethical committee approval and patients consent, patients were randomized into one of the two groups. Once inside the operating room, after connecting the routine monitors like Electrocardiography (ECG), Noninvasive blood pressure (NIBP) and Pulse oximetry (SPO_2) to note down the baseline parameters and after starting intravenous fluid administration with Ringer Lactate (RL), all patients were premedicated with inj.ondensetran 0.08 mg/kg, inj.glycopyrolate 0.02 mg/kg, inj.midazolam 0.01-0.02 mg/kg and inj.fentanyl 2µg/kg intravenously. Preoxygenation was given with 100% O_2 for 3 minutes. After inducing with inj.propofol 1-2 mg/kg iv and achieving muscle relaxation with succinyl choline 2 mg/kg iv, haemodynamic parameters were noted down just prior to laryngoscopy.

Group M

After putting the patients in "sniffing" position, with handle of the McCoy laryngoscope (size 3) held in left hand, blade was inserted into the right side of the mouth and advanced along the right side of the tongue towards the right tonsillar fossa. Then the tongue was lateralized, bringing the blade tip towards the midline and advancing further after visualization of epiglottis to place the tip in the vallecula. The tip was then flexed using the lever adjacent to the handle as the tongue and soft tissue are lifted up to get the best possible view of glottis and was graded using Cormack and Lehane classification. Endotracheal intubation was done with appropriate sized ETT and position was confirmed by end tidal CO_2 tracing.

Group A

Airtraq (small size) was prepared prior to use by lubricating the front and back and loading the side channel with lubricated ETT. Then it was turned on 60 seconds prior to laryngoscopy to activate the antifogging system. With the patient in “neutral” position, after opening the mouth by scissoring technique, Airtraq was introduced into patient’s mouth in the midline and slided through the oropharynx maintaining midline all the time. Airway structures were identified through view finder of the Airtraq before it reached the vertical plane and advanced till epiglottis was seen.

The tip of the Airtraq was then placed under the epiglottis, lifting it out of the way to get the best possible view of glottis which was assessed using Cormack and Lehane grading. After adjusting the Airtraq position to align the glottis in the centre of the field, endotracheal intubation was done by advancing the ETT till it was visualized passing through the glottis. Position of ETT was confirmed using end tidal CO_2 tracing, after which it was separated from the Airtraq by pulling the Airtraq laterally away from the ETT while holding the ETT in place with the other hand.

Airway parameters like ease of insertion (EOI) using Likert's scale, laryngoscopy time (LT) that is the time from insertion of the device into the mouth until getting ideal visualization of vocal cords, Cormack and Lehane grading, time taken to intubate (TTI) which is the time from insertion of the device into the mouth until securing the airway confirmed by end titdal CO_2 tracing, intubation difficulty score (IDS), airway trauma were all noted down.

Haemodynamic parameters including heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure were recorded just prior to laryngoscopy and intubation (PI), during the time of laryngoscopy and intubation (I) and one minute after intubation (AI).

Anesthesia was maintained with O_2:N_2O (33%:67%) and desflurane 4%. A loading dose of inj.vecuronium bromide 0.1 mg/kg followed by one fourth of the dose for maintenance.

At the end of the surgery, neuromuscular blockade was reversed with inj.glycopyrrolate 0.01 mg/kg and inj.neostigmine 0.05 mg/kg after the return of spontaneous breathing attempt. After attaining adequate reversal from neuromuscular blockade, patients were extubated following a through suctioning of throat and oral cavity.

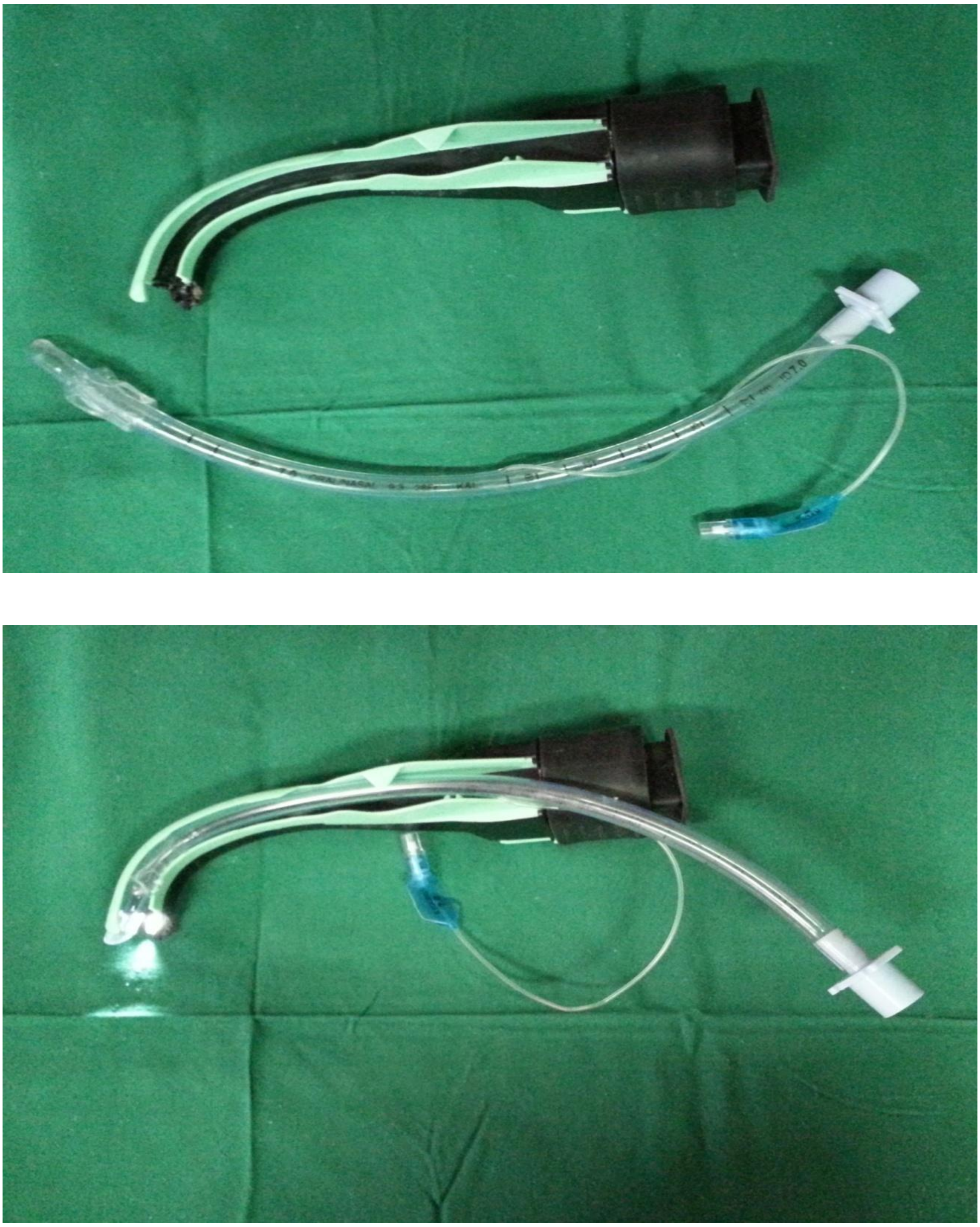
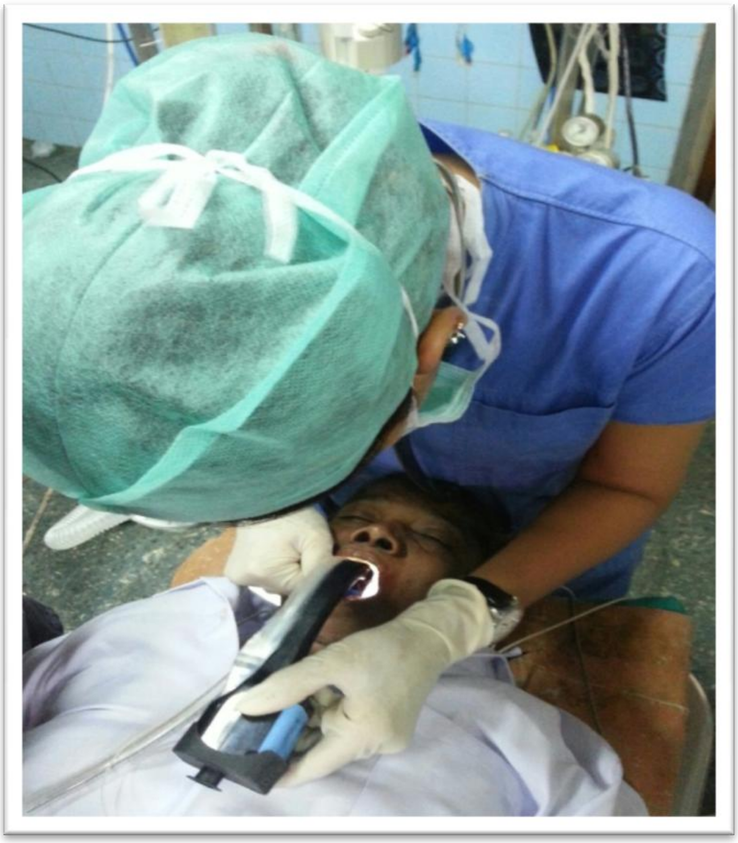


Fig. 11

The Airtraq optical laryngoscope



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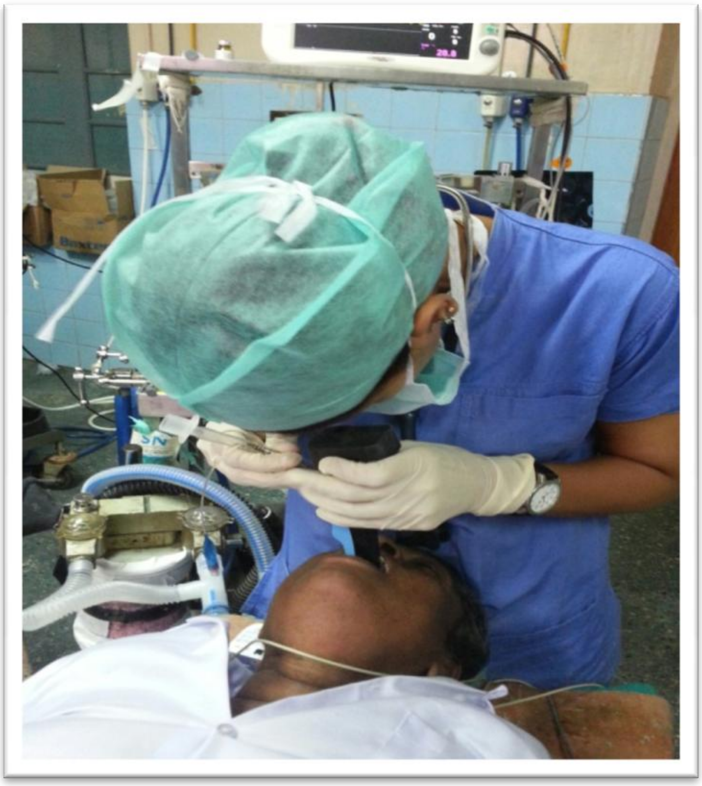

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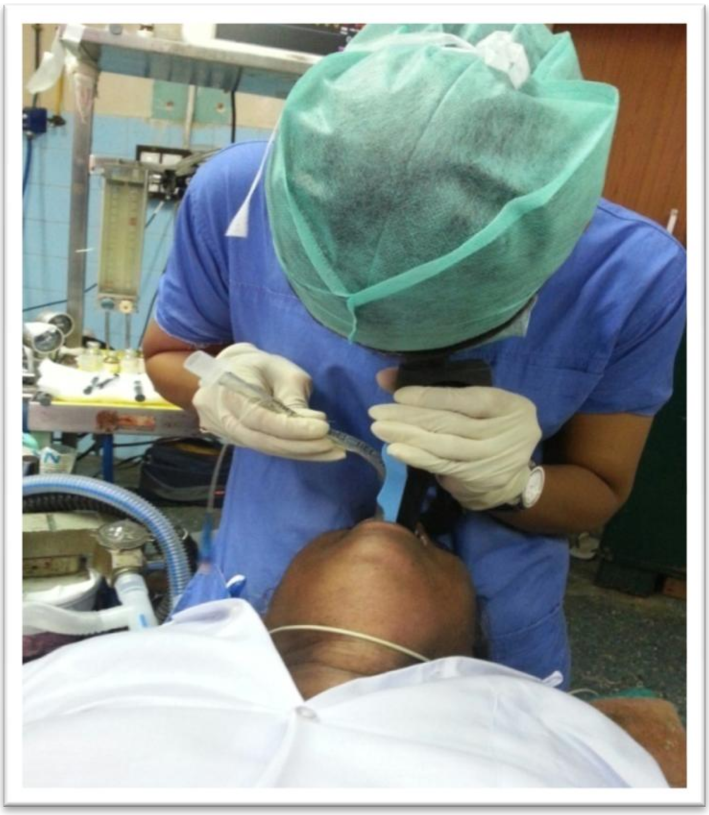

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Fig. 12

Airtraq intubation

Observation & Results

OBSERVATION AND RESULTS

The results obtained were analysed with SPSS (Statistical Package for Social Sciences) version 13.0 using t-test and chi square test.

Demographic variables

Table 1

Age wise distribution

Age (years)	Group M	Group A	Total
20-30	23%	20%	21%
31-40	30%	33%	32%
41-50	37%	17%	27%
51-60	10%	30%	20%
Total	100%	100%	100%

Graph 1

Age wise distribution

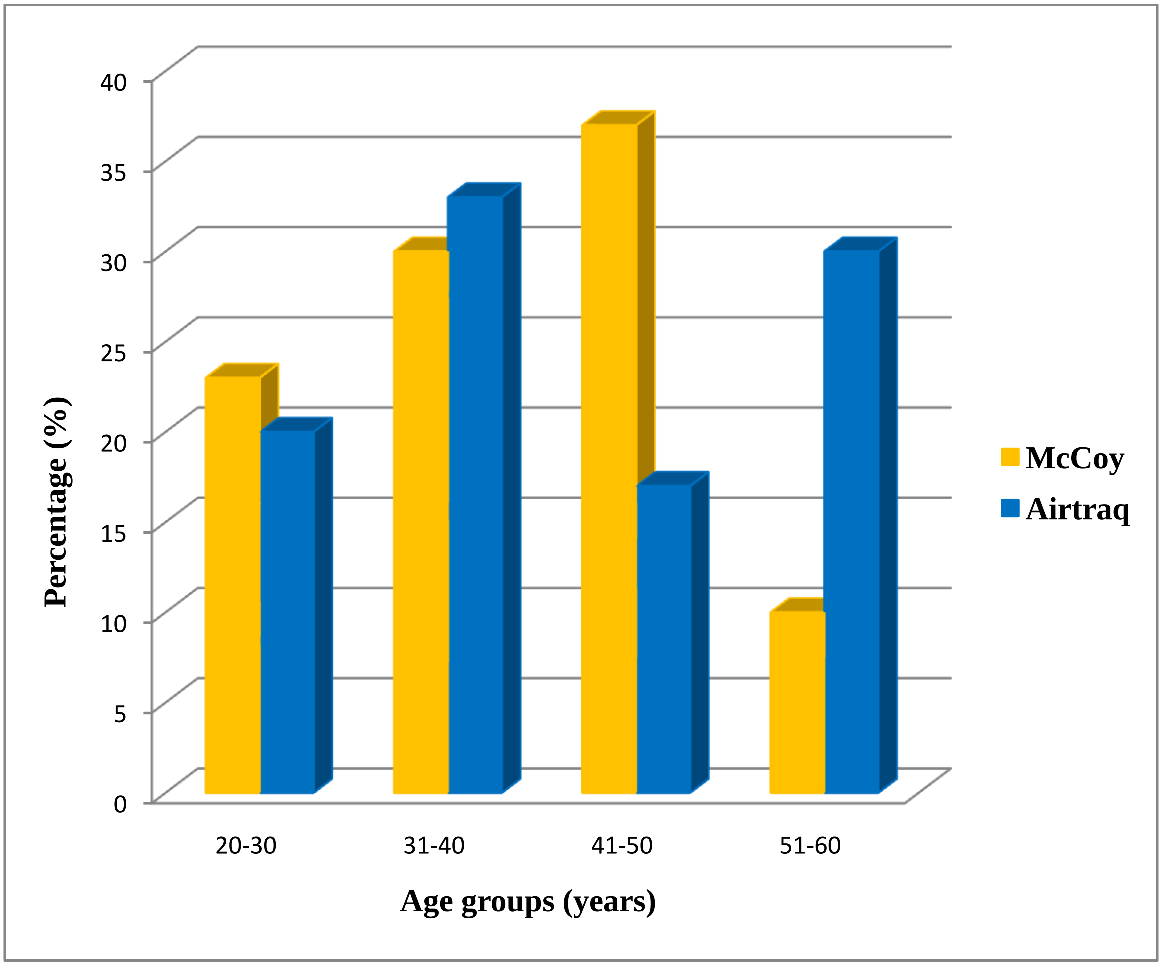


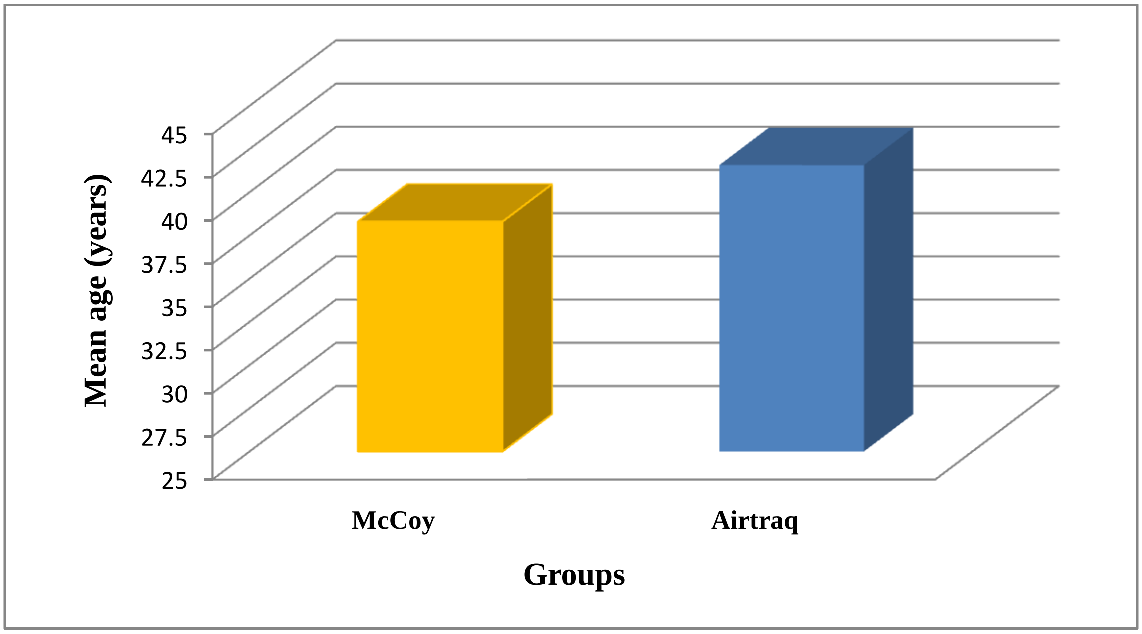
Table 2

Mean age distribution (years)

	Group M	Group A
Mean +/- SD	38.30 +/- 9.96	41.57 +/- 11.54

Graph 2

Mean Age



Age wise distribution is shown in table 1 and graph 1, while mean age distribution by groups is shown in table 2 and graph 2. Patients in the age group between 20 to 60 years were included in the study and statistical analyses showed their differences between the two groups to be statistically insignificant (p=0.2452).

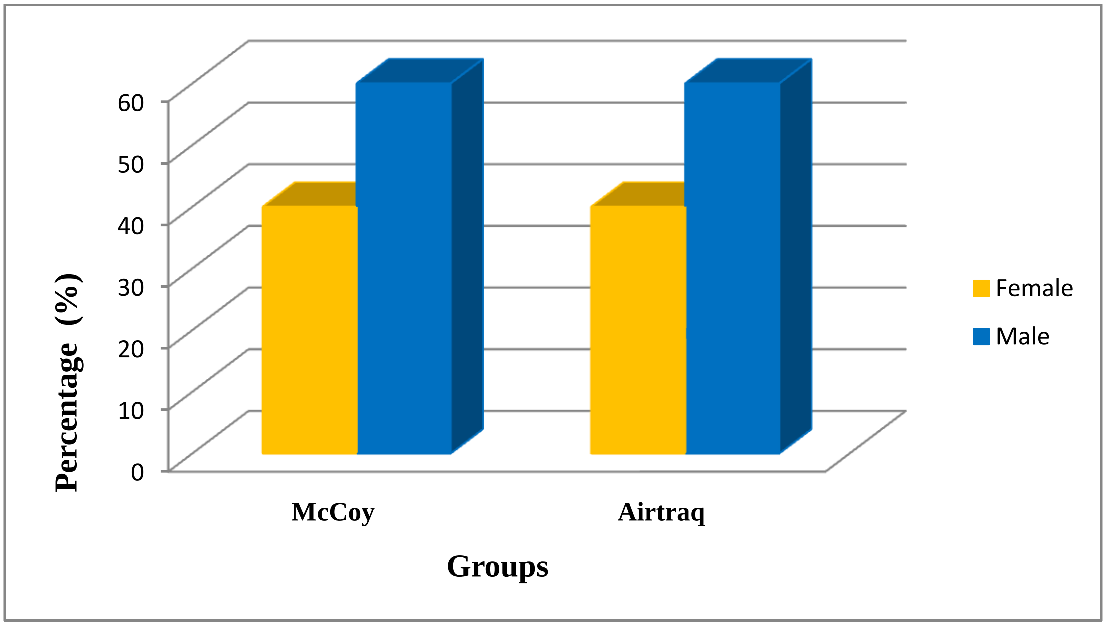
Table 3

Sex wise distribution

Sex	Group M	Group A	Total
Male	12 40%	12 40%	24 40%
Female	18 60%	18 60%	36 60%
Total	100%	100%	100%

Graph 3

Sex wise distribution



Sex wise distribution of the patients is shown in percentage in table 3 and graph 3.40% of the patients were females and 60% of them were males in both the groups and found to be comparable between the two groups (p=1.000).

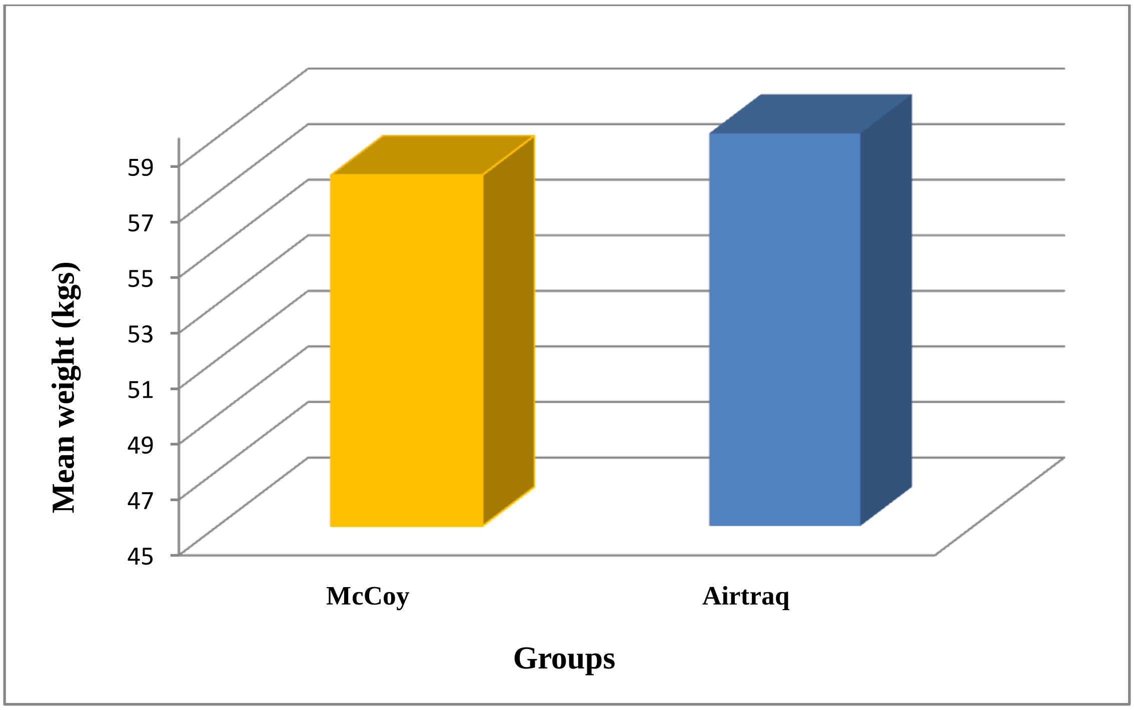
Table 4

Mean weight (Kg)

	Group M	Group A
Mean +/- SD	57.63 +/- 6.52	59.13 +/- 5.32

Graph 4

Mean weight



The mean weight of the patients in two groups is shown in the table 4 and graph 4. The mean weight of the patients was 57.63 +/-6.52 in Group M and 59.13 +/- 5.32 in Group A. The differences were found to be statistically insignificant (p=0.3326).

Table 5

Mean height (cms)

	Group M	Group A
Mean +/- SD	157.30 +/- 5.45	157.80 +/- 5.13

Graph 5

Mean height

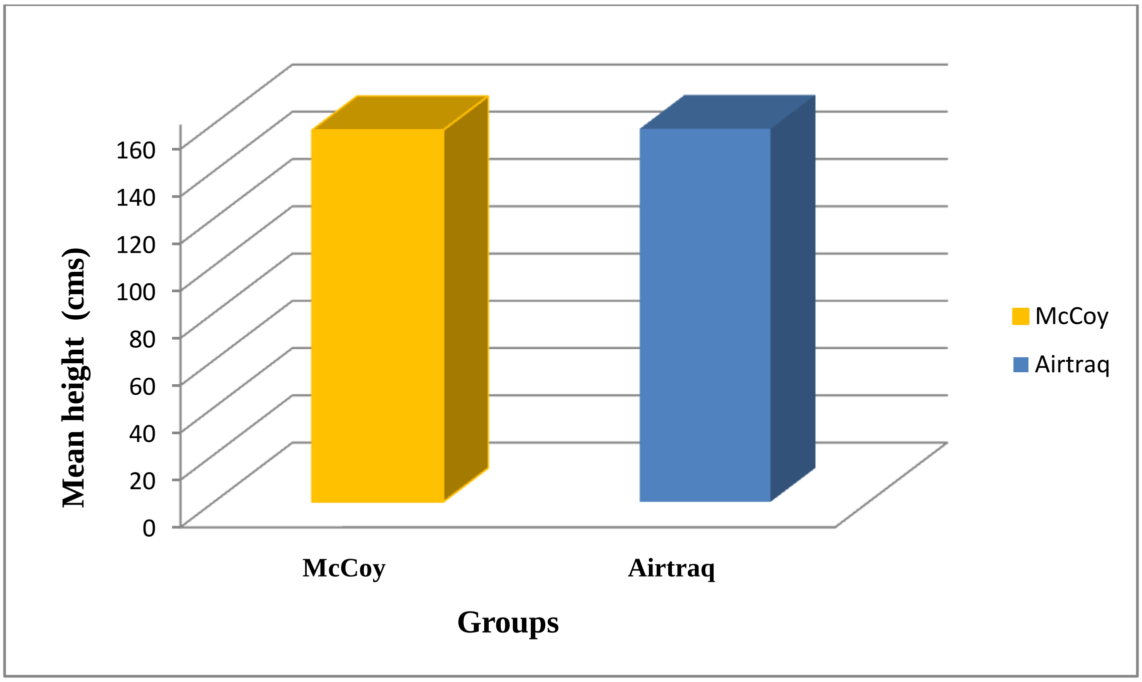


Table 5 and graph 5 shows the mean height of the patients among the two groups. Group M patients had a mean height of 157.3 +/- 5.45 cms and in Group A it was 157.8 +/- 5.13 cms and the differences were found to be statistically insignificant (p=0.7156).

Airway parameters

Table 6

Mean BMI (kg/m^2)

	Group M	Group A
Mean +/- SD	23.29 +/- 2.53	23.78 +/- 2.24

Graph 6

Mean BMI

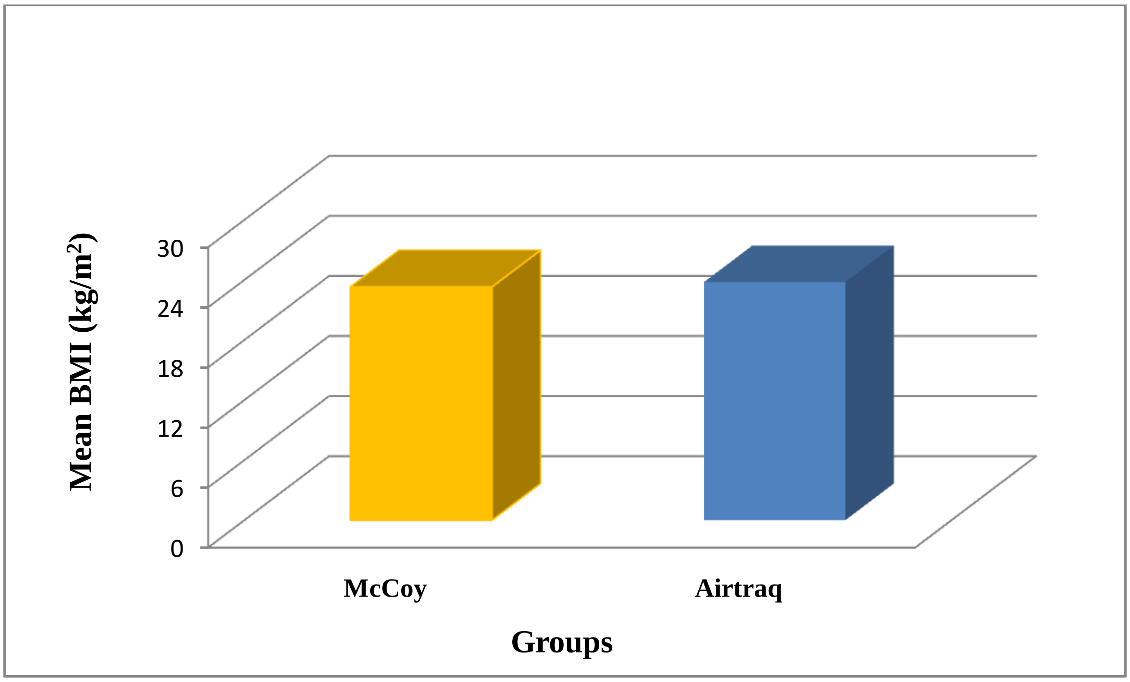


Table 6 and group 6 shows the mean BMI of the patients among the two groups.

The mean BMI of the patients in Group M was 23.29 +/- 2.53 kg/m^2 and in Group A was 23.78 +/- 2.24 kg/m^2 and the differences were found to be statistically insignificant (p=0.4336).

Table 7

Mallampati classification

MPC	Group		Total
	M	A	
I	17 57%	16 53%	33 55%
II	13 43%	14 47%	27 45%
Total	30 100%	30 100%	60 100%

Graph 7

Mallampati classification

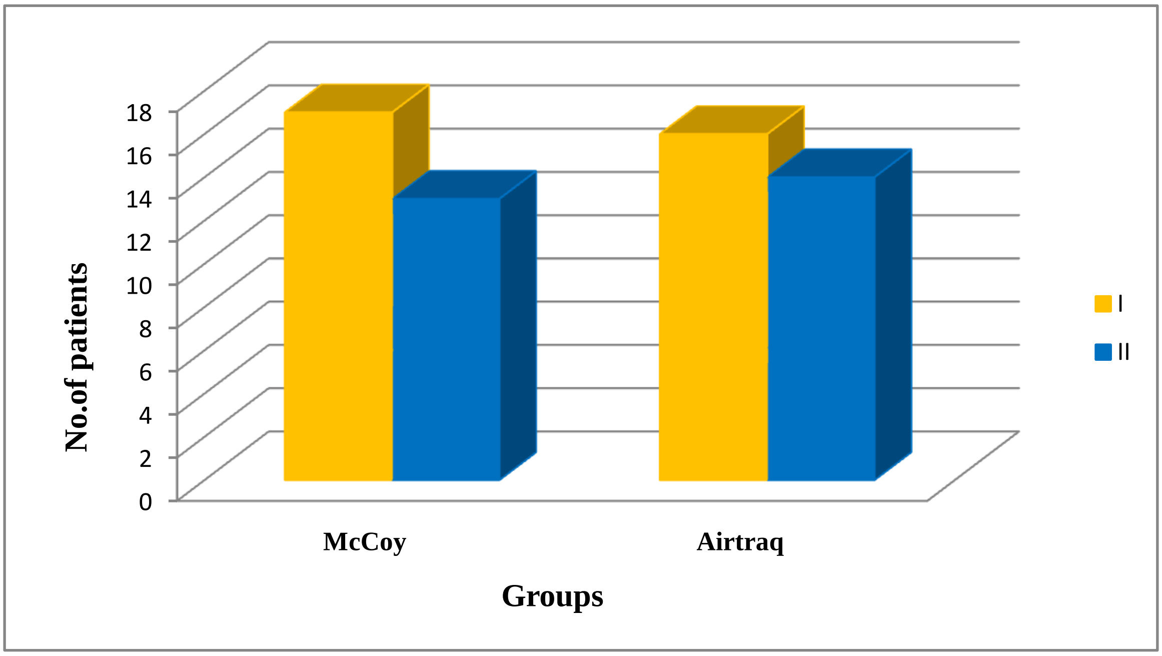


Table 7 and graph 7 shows the mallampati grading in both the groups.

In Group M, 17(57%) patients had MPC I and 13(43%) patients had MPC II, while in Group A, 16(53%) patients had MPC I and 14(47%) patients had MPC II.

The difference in the MPC between the two groups were statistically insignificant (cc=0.067; p=0.795).

Table 8

Ease of Insertion (Likert's scale)

EOI	Group M	Group A	Total
0	0 0%	7 23%	7 12%
1	5 17%	23 77%	28 47%
2	25 83%	0 0%	25 41%
Total	30 100%	30 100%	60 100%

Graph 8

Ease of insertion (Likert's scale)

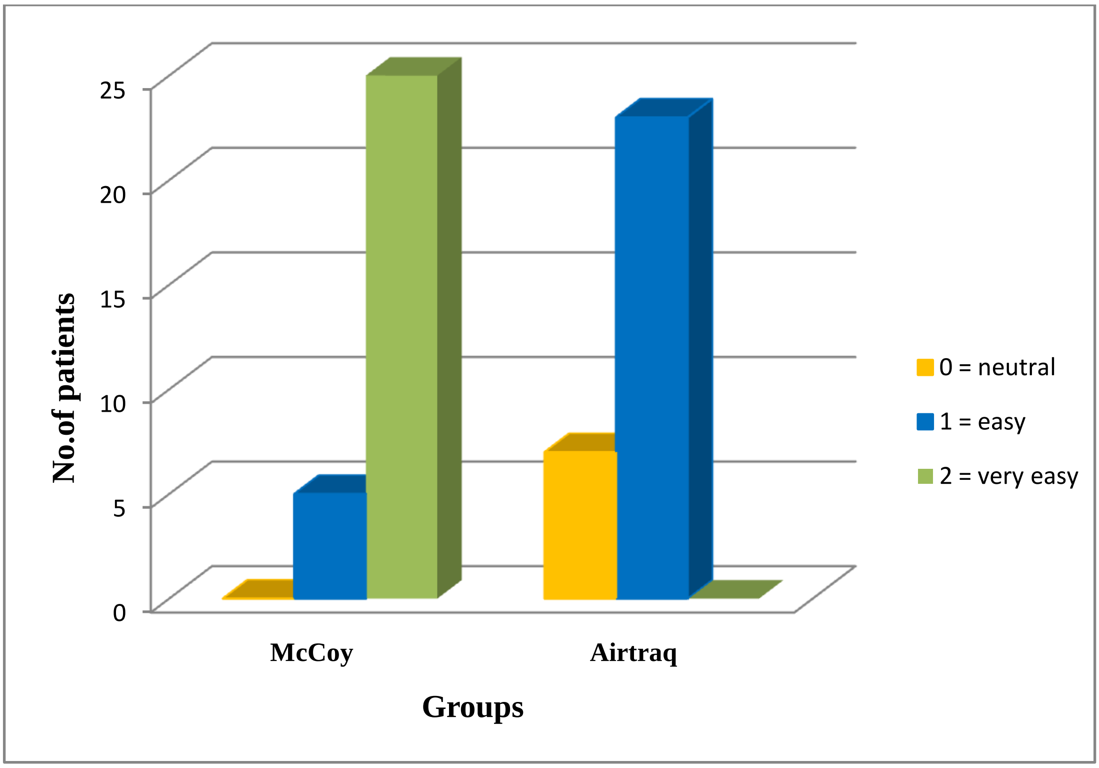


Table 8 and graph 8 shows Likert's scale for Ease of insertion among the two groups.

In Group M, insertion of McCoy was very easy in 25 patients and easy in 5 patients.

In Group A, insertion of Airtraq was neutral in 7 patients and easy in 23 patients.

The differences in the Ease of insertion of laryngoscopes between the two groups were statistically highly significant (cc=43.571; p=<0.001).

Table 9

Laryngoscopy time (sec)

	Group M	Group A
Mean +/- SD	11.1 +/- 2.18	14.5 +/- 1.96

Graph 9

Laryngoscopy time

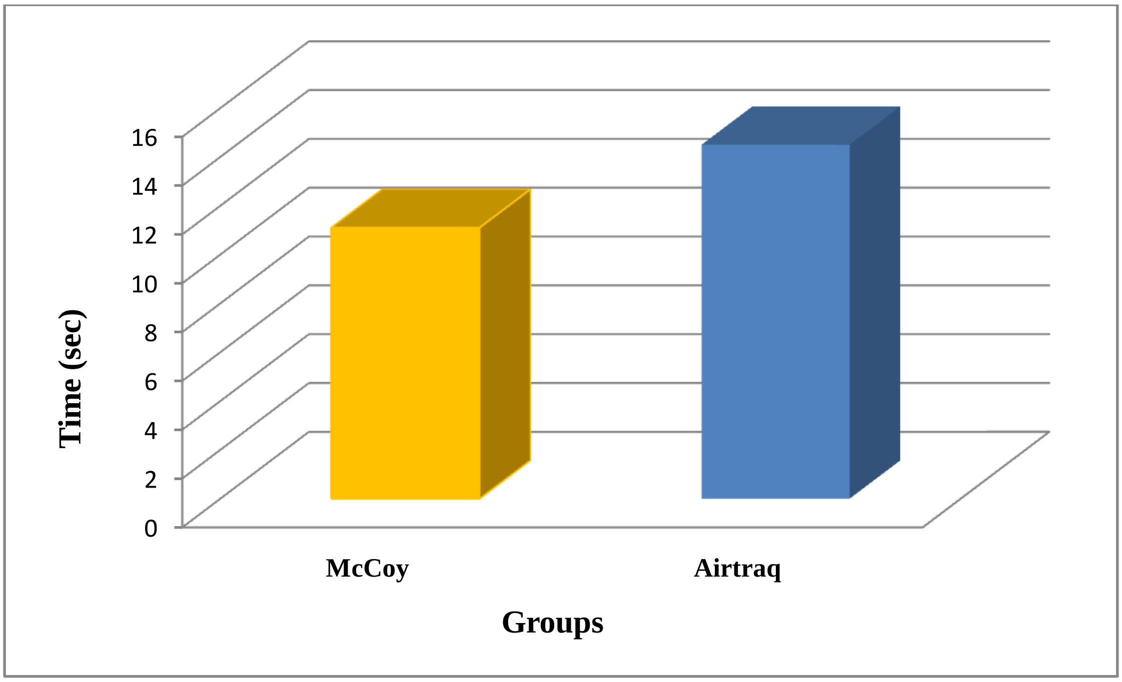


Table 9 and graph 9 shows laryngoscopy time between the two groups. The mean laryngoscopy time was found to be 11.1 +/- 2.18 sec in Group M and 14.5 +/- 1.96 sec in Group A. The differences in the mean laryngoscopy time between the two groups were statistically significant (p= <0.001).

Table 10

Cormack and Lehane grading

CLG	Group		Total
	M	A	
I	15 50%	30 100%	45 75%
II	15 50%	0 0%	15 25%
Total	30 100%	30 100%	60 100%

Graph 10

Cormack and Lehane grading

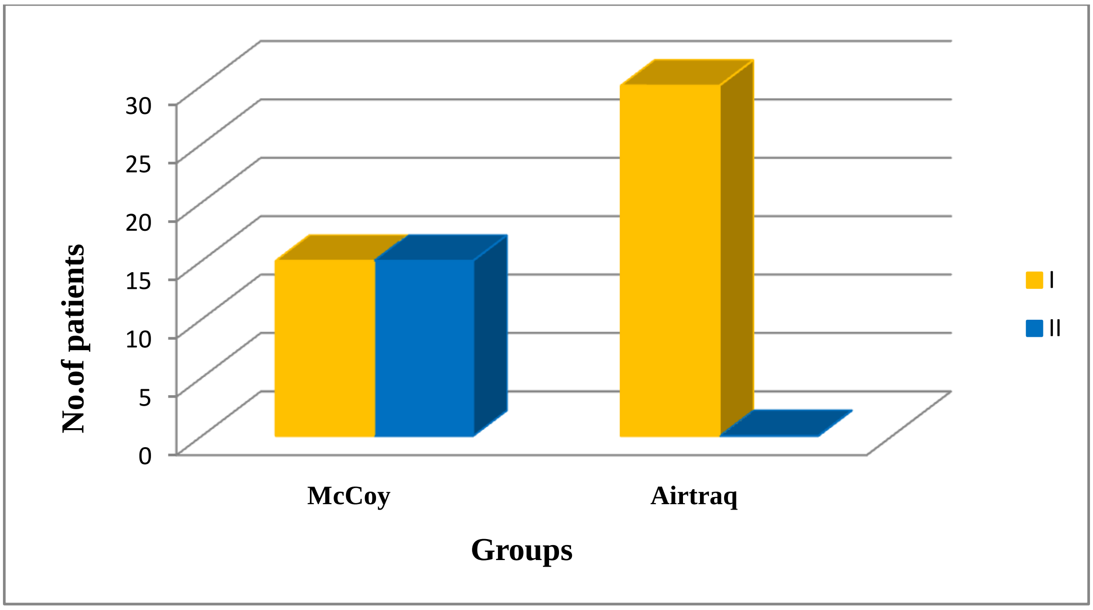


Table 10 and graph 10 shows Cormack and Lehane grading(CLG) of glottis view between the two groups.

In Group M, 15 patients had CLG I and the remaining 15 patients had CLG II, while in Group A all the patients had CLG I.

The differences in the Cormack and Lehane grading between the two groups were statistically highly significant (cc=20; $p=<0.001$).

Table 11

Time to intubate (sec)

	Group M	Group A
Mean +/- SD	18.5667 +/- 7.9076	23.6667 +/- 6.7022

Graph 11

Time to intubate

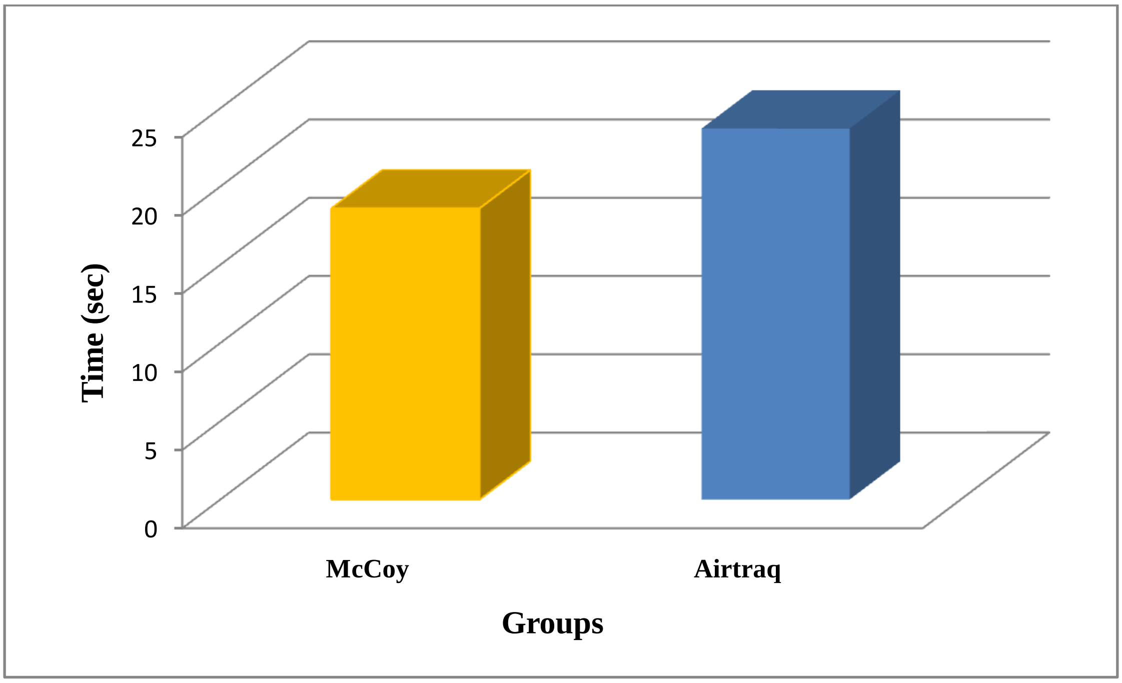


Table 11 and graph 11 shows the mean time taken to intubate among the two groups.

The mean time taken to intubate was 18.5667 +/- 7.9076 sec in Group M and 23.6667 +/- 6.7022sec in Group A. The differences were found to be statistically highly significant (p=<0.001).

Table 12

Intubation Difficulty Score

IDS	Group		Total
	M	A	
<3	24 80%	29 97%	53 88%
>=3	6 20%	1 3%	7 12%
	30 100%	30 100%	60 100%

Graph 12

Intubation Difficulty Score

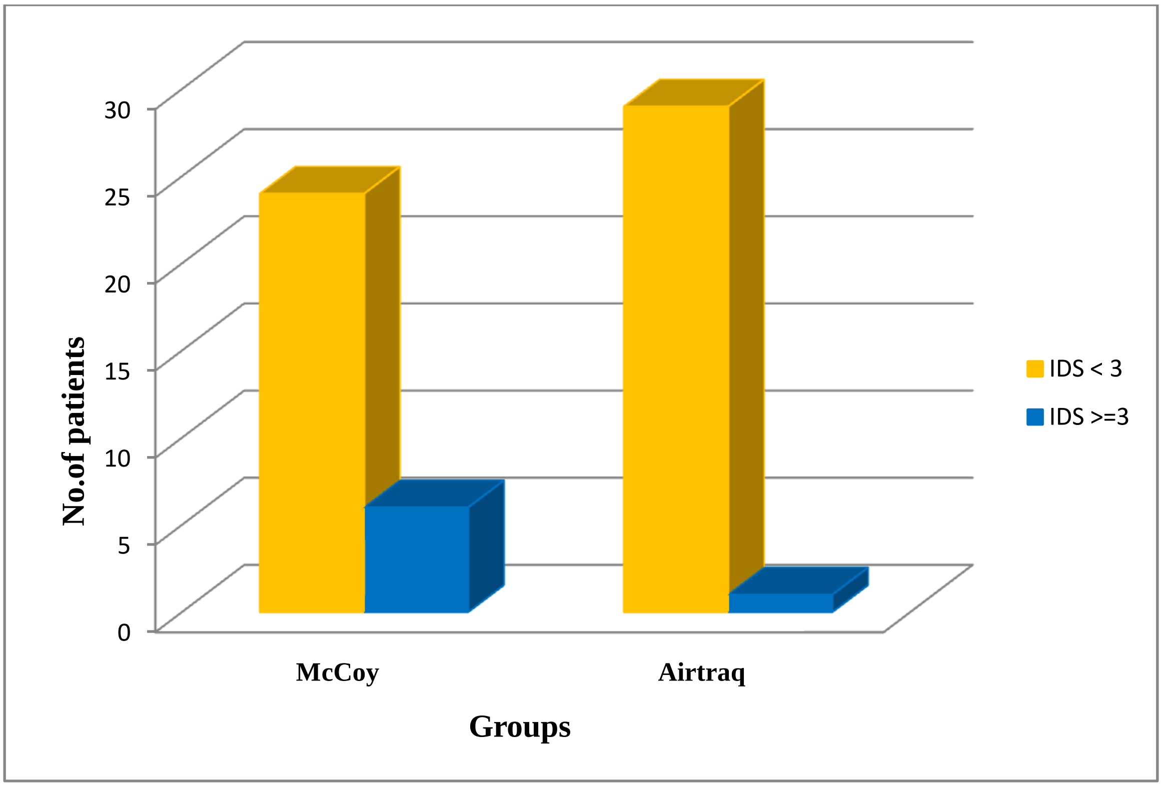


Table 12 and graph 12 shows the Intubation difficulty score among the two groups.

In Group M, 24 patients had IDS <3 and 6 patients had IDS >=3. In Group A, 29 patients had IDS <3 and only one patient had IDS of 4.

The differences were found to be statistically significant (cc=19.095; p=0.002).

Haemodynamic parameters

Table 13

Mean heart rate (bpm)

	Group M	Group A
Prior to intubation (PI)	80.40 (+/- 15.78)	78.57 (+/- 13.70)
Intubation (I)	87.93 (+/- 14.57)	81.67 (+/- 13.60)
After intubation (1min) (AI)	97.47 (+/- 14.20)	87.63 (+/- 14.07)

Graph 13

Mean heart rate

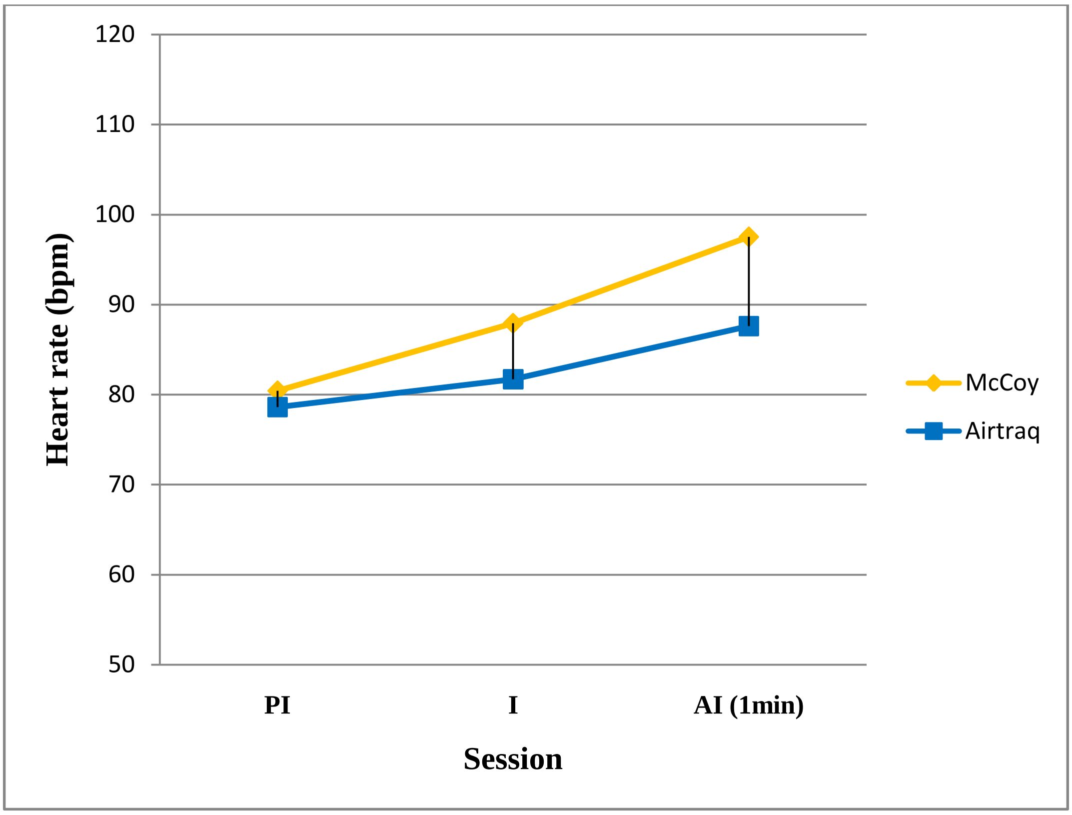


Table 13 and graph 13 shows the mean heart rate in both the groups.

In Group M, the mean heart rate was 80.4 (+/- 15.78) bpm prior to intubation, 87.93 (+/- 14.57) bpm during intubation and 97.42 (+/- 14.20) bpm 1 min after intubation.

In Group A, the mean heart rate was 78.57 (+/- 13.7) bpm prior to intubation, 81.67 (+/- 13.6) bpm during intubation and 87.63 (+/-14.07) bpm 1min after intubation.

The differences in the mean heart rate prior to intubation and during intubation between the two groups were found to be statistically insignificant with p value of 0.6327 and 0.0904 respectively. The differences in the mean heart rate 1 min after the intubation were statistically significant (p=0.0092). The increase in heart rate after intubation was more with McCoy laryngoscope compared to Airtraq laryngoscope.

Table 14

Mean systolic blood pressure (mmHg)

	Group M	Group A
Prior to intubation (PI)	100.4 (+/- 8.516)	98.73 (+/- 6.607)
Intubation (I)	109.73 (+/- 11.66)	101.97 (+/- 5.45)
After intubation (1min) (AI)	129.67 (+/- 14.03)	111.57 (+/- 9.73)

Graph 14

Mean systolic blood pressure

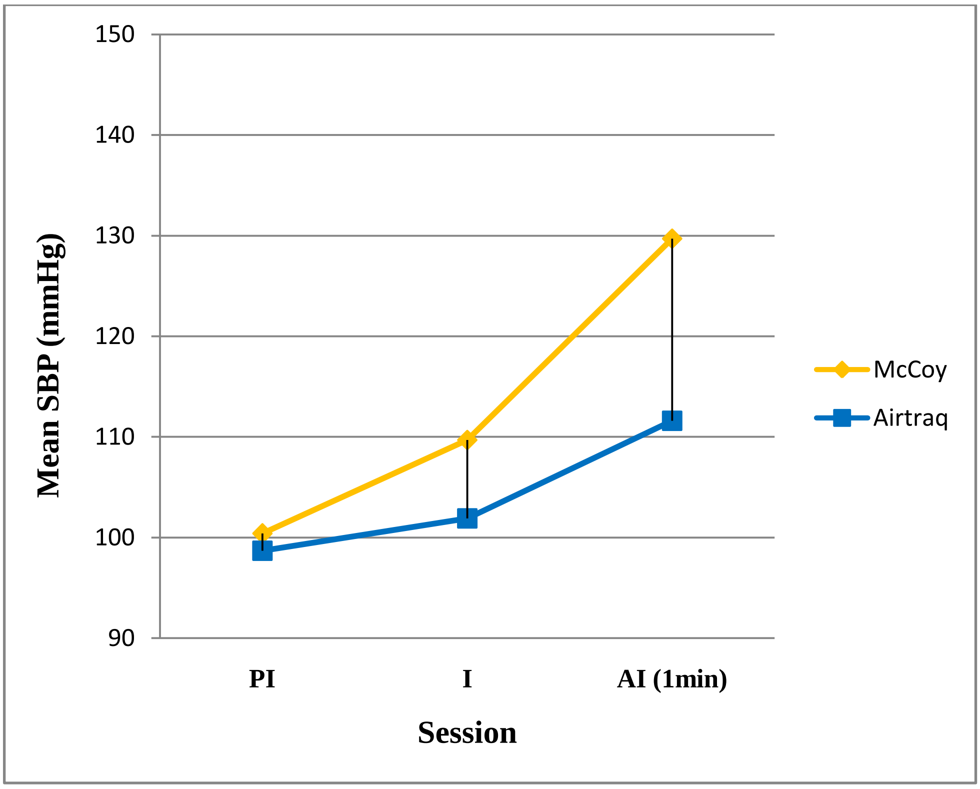


Table 14 and graph 14 shows the mean systolic blood pressure of patients in both the groups.

In Group M, the mean systolic blood pressure was 100.4 (+/- 8.516) mmHg prior to intubation, 109.73 (+/- 11.66) mmHg during intubation and 129.67 (+/- 14.03) mmHg 1 minute after intubation.

In Group A, it was 98.73 (+/- 6.607) mmHg prior to intubation, 101.97 (+/- 5.45) mmHg during intubation and 111.57 (+/- 9.73) mmHg 1 minute after intubation.

The increase in the systolic blood pressure during intubation and 1 min after intubation were statistically significant between the two groups and was found to be more with the McCoy laryngoscope than with the Airtraq laryngoscope.

Table 15

Mean diastolic blood pressure (mmHg)

	Group M	Group A
Prior to intubation (PI)	59.6 (+/- 7.67)	56.7 (+/- 4.67)
Intubation (I)	67.23 (+/- 11.76)	57.37 (+/- 3.21)
After intubation (AI)	81.77 (+/- 11.25)	66.13 (+/- 7.76)

Graph 15

Mean diastolic blood pressure

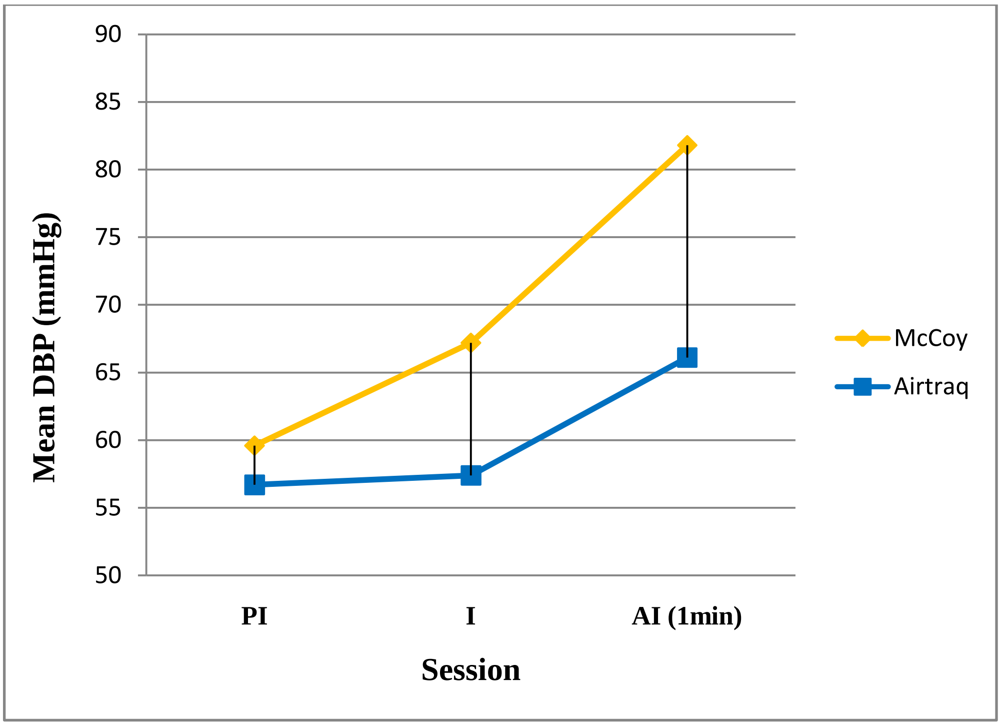


Table 15 and graph 15 shows the mean diastolic blood pressure in both the groups.

In Group M, the mean diastolic blood pressure was 59.6 (+/- 7.67) mmHg prior to intubation, 67.2 (+/- 11.76) mmHg during intubation and 81.77 (+/- 11.25) mmHg 1 minute after intubation.

In Group A, it was 56.7 (+/- 4.67) mmHg prior to intubation, 57.37 (+/- 3.21) mmHg during intubation and 66.1 (+/- 7.76) mmHg 1 minute after intubation.

The increase in diastolic blood pressure during and 1 min after intubation were statistically highly significant between the two groups and was found to be more with the McCoy laryngoscope than with the Airtraq laryngoscope with p value of <0.001.

Table 16

Mean arterial pressure (mmHg)

	Group M	Group A
Prior to intubation (PI)	72.5 (+/- 7.47)	70.17 (+/- 5.36)
Intubation (I)	81.00 (+/- 10.92)	72.27 (+/- 3.48)
After intubation (1min) (AI)	97.17 (+/- 11.65)	81.17 (+/- 8.06)

Graph 16

Mean arterial pressure

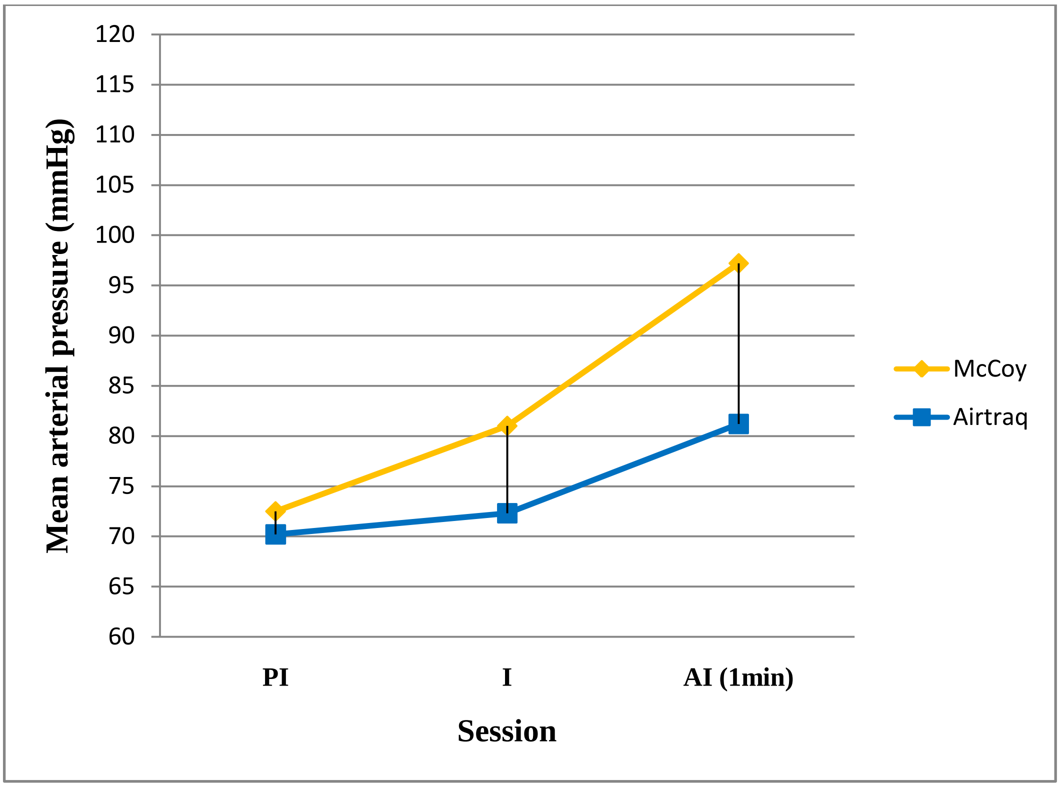


Table 16 and graph 16 shows the mean arterial pressure in both the groups.

In Group M, the mean arterial pressure was 72.50 (+/- 7.47) mmHg prior to intubation, 81.0 (+/-10.92) mmHg during intubation and 97.17 (+/-11.65) mmHg 1 minute after intubation.

In Group A, it was 70.17 (+/- 5.36) mmHg prior to intubation, 72.27(+/- 3.48) mmHg during intubation and 81.17(+/- 8.06) mmHg 1 minute after intubation.

The increase in mean arterial pressure during and after intubation was statistically highly significant ($p<0.001$) and was more with the McCoy laryngoscope compared to the Airtraq laryngoscope.

Table 17

Airway trauma

Airway trauma	Group		Total
	M	A	
No (N)	27 90%	27 90%	54 90%
Yes (Y)	3 10%	3 10%	6 10%
	30 100%	30 100%	60 100%

Graph 17

Airway trauma

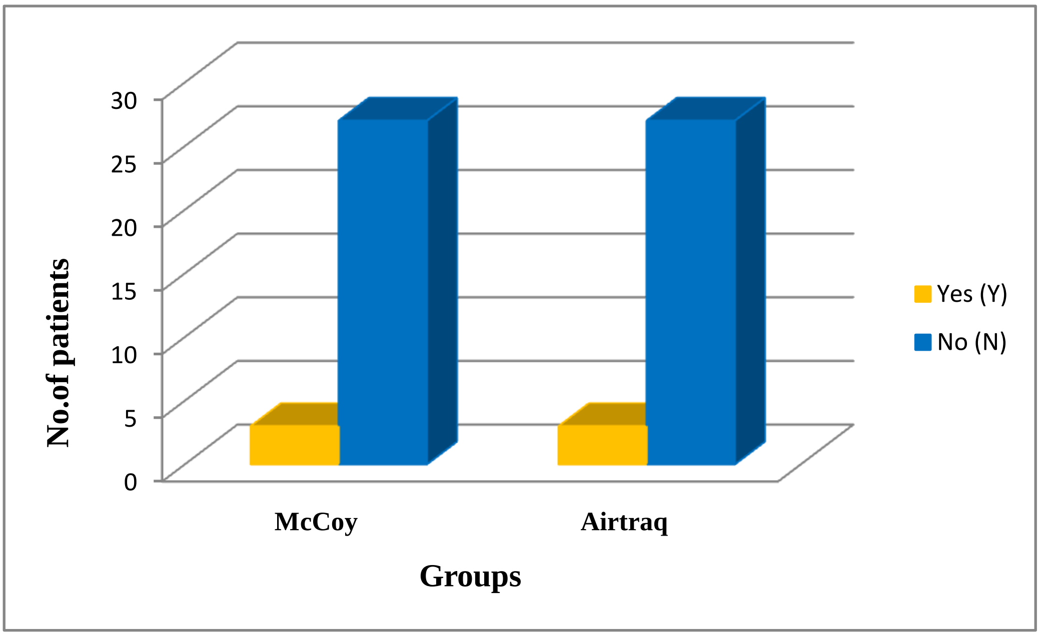


Table 16 and graph 16 shows the incidence of airway trauma in both the groups. Three patients in each group had incidence of airway trauma and the differences were statistically insignificant (cc=0; p=1).

Discussion

DISCUSSION

Laryngoscopy and endotracheal intubation forms an important step in administration of general anaesthesia. Method of laryngoscopy can be direct or indirect, ranging from simple rigid scopy with light bulb to complex fiberoptic video scopies. Direct laryngoscopy and endotracheal intubation is done under direct vision and needs a proper alignment of airway axes.

Direct laryngoscopy and endo tracheal intubation are noxious stimuli and can provoke adverse cardiovascular response producing tachycardia and hypertension.Though transient, this may become hazardous to those with hypertension, myocardial insufficiency and cerebrovascular disease. An ideal laryngoscopic technique should give a good glottic view, facilitate easy intubation with minimal haemodynamic alterations and airway complications.

The Macintosh blade is one of the most commonly used blade and various modifications have been developed since its invention.The McCoy blade was introduced in the nineties and has a hinge on the tip to avoid the lifting force in the vallecula thereby lowering the haemodynamic response related to laryngoscopy and tracheal intubation compared to the routinely used Macintosh laryngoscopes.

The Airtraq optical laryngoscope (Prodol Meditec S.A., Vicaya, Spain) is a rigid indirect laryngoscope which can be used for routine endotracheal intubation as well as in patients with difficult airways. It is anatomically shaped and contains two side by side channels, one with series of lenses and prisms and other for the placement of endotracheal tube, a built in antifog system and a low temperature light and helps in visualisation of glottis without the need for alignment of oral, pharyngeal and laryngeal axes thus producing minimal haemodynamic alteration.

In this study, McCoy and Airtraq laryngoscopes were compared with respect to efficacy of laryngoscopy, intubating condition, haemodynamic stability and airway trauma in 60 patients at reduced risk of difficult intubation by randomizing them into one of the two groups, the McCoy(M) and the Airtraq(A) group.

The results obtained were analysed with SPSS (Statistical Package for Social Sciences) version 13 using student t-test and chi square test.

Demographic parameters

The mean age in Group M was 38.3 +/- 9.96 years and in Group A was 41.57 +/- 11.54 years. The differences in mean age between the two groups were statistically insignificant (p=0.2452).

The sex distribution showed that 40% of the patients were females and 60% of them were males in both the groups and found to be comparable between the two groups (p=1.000).

The mean weight of the patients was 57.63 +/-6.52 in Group M and 59.13 +/- 5.32 in Group A. The differences were found to be statistically insignificant (p=0.3326).

Group M patients had a mean height of 157.3 +/- 5.45 cms and in Group A it was 157.8 +/- 5.13 cms and the differences were found to be statistically insignificant (p=0.7156).

The mean BMI of the patients in Group M was 23.29 +/- 2.53 kg/m^2 and in Group A was 23.78 +/- 2.24 kg/m^2 and the differences were found to be statistically insignificant (p=0.4336).

Thus both the groups were comparable with respect to age, sex, weight, height and BMI.

Airway parameters

MPC

In Group M, 17(57%) patients had MPC I and 13(43%) patients had MPC II, while in Group A, 16(53%) patients had MPC I and

14(47%) patients had MPC II. The difference in the MPC between the two groups were statistically insignificant (cc=0.067; p=0.795).

Ease of insertion (EOI)

Ease of insertion of the laryngoscopes into the mouth was observed and graded using Likert's scale as very difficult, difficult, neutral, easy and very easy. In Group M, insertion of McCoy was very easy in 25 patients and easy in 5 patients. In Group A, insertion of Airtraq was neutral in 7 patients and easy in 23 patients.

The differences in the Ease of insertion of laryngoscopes between the two groups were statistically highly significant (cc=43.571; p=<0.001).

The results had a good correlation with the previous study conducted by Padmaja durga et al. to compare the tracheal intubation using Airtraq laryngoscope in patients with normal airway with and without rigid cervical collar. They observed Ease of insertion using Likert's scale and found that the insertion of Airtraq to be easy in majority of the patients in the absence of cervical collar.

Laryngoscopy time (LT)

The mean laryngoscopy time was found to be 11.1 +/- 2.18 sec in Group M and 14.5 +/- 1.96 sec in Group A. The differences in the mean laryngoscopy time between the two groups were statistically highly significant (p=<0.001), with more time required in Group A compared to Group M. This could be due to reduced ease of insertion of Airtraq laryngoscope into the mouth compared to the McCoy laryngoscope.

Glottic view

The visualization of glottis was graded according to Cormack and Lehane grading. In Group M, 15 patients had CLG I and the remaining 15 patients had CLG II, while in Group A all the patients had CLG I. The differences in the Cormack and Lehane grading between the two groups were statistically highly significant (cc=20; p=<0.001).

In our study, the visualisation of larynx according to Cormack and Lehane grading was better with the Airtraq laryngoscope compared to McCoy laryngoscope and correlated well with the previous studies conducted by Maharaj et al., Arino et al. and Padmaja durga et al.

Time to intubate (TTI)

The mean time taken to intubate was 18.5667 +/- 7.9076 sec in Group M and 23.6667 +/- 6.7022sec in Group A. The differences were found to be statistically highly significant (p=<0.001).

The result correlated with the previous study by Sherren et al. where they compared Macintosh, McCoy, Airtraq and the Intubating laryngeal mask airway in a difficult airway scenario with MILS and showed that the mean time to intubate was longer with the Airtraq laryngoscope (39.3 sec) compared to others.

However the result did not correlate with the study done by padmaja durga et.al where they showed that the mean time to intubate was longer with McCoy latyngoscope (33.2 sec) compared to Airtraq laryngoscope (28.9 sec). This could be due to the presence of rigid cervical collar simulating cervical immobilisation.

In our study, the longer time to intubate with the Airtraq laryngoscope could be attributed to the longer laryngoscopy time due to reduced ease of insertion compared to the McCoy laryngoscope.

Intubation difficulty score

In Group M, 24 patients had IDS <3 and 6 patients had IDS >=3. That is, the IDS were 0 in 30%, 1 in 33%, 2 in 17%, 3 in 13% and 5 in 7% of the patients. In Group A, 29 patients had IDS <3 and only one patient had IDS of 4.That is the IDS was 0 in 10%, 1 in 84%, 2 in 3% and 4 in 3% of patients. The differences were found to be statistically significant (cc=19.095; p=0.002).

The Intubation difficulty score was better with the Airtraq laryngoscope than with the McCoy laryngoscope.

Haemodynamic parameters

Heart rate

The mean heart rate was 80.4 (+/- 15.78) bpm prior to intubation and increased to 87.93 (+/- 14.57) bpm during intubation and then to 97.42 (+/- 14.20) bpm 1 min after intubation in Group M. In Group A, the mean heart rate was 78.57 (+/- 13.7) bpm prior to intubation and increased to 81.67 (+/- 13.6) bpm during intubation and then to 87.63 (+/- 14.07) bpm 1min after intubation.

The differences in the mean heart rate prior to intubation and during intubation between the two groups were found to be statistically insignificant with p value of 0.6327 and 0.0904 respectively. However the differences in the mean heart rate 1 min after the intubation were statistically significant (p=0.0092) between the two groups and the increase in heart rate after intubation was more with McCoy laryngoscope compared to Airtraq laryngoscope.

Systolic blood pressure

The mean systolic blood pressure was 100.4 (+/- 8.516) mmHg prior to intubation and increased to 109.73 (+/- 11.66) mmHg during intubation and further to129.67 (+/- 14.03) mmHg 1 minute after intubation in Group M. In Group A, it was 98.73 (+/- 6.607) mmHg prior to intubation, 101.97 (+/- 5.45) mmHg during intubation and 111.57 (+/- 9.73) mmHg 1 minute after intubation.

The increase in the systolic blood pressure during intubation and 1 min after intubation was statistically significant between the two groups and was found to be more with the McCoy laryngoscope than with the Airtraq laryngoscope.

Diastolic blood pressure

The mean diastolic blood pressure was 59.6 (+/- 7.67) mmHg prior to intubation and increased to 67.2 (+/- 11.76) mmHg during intubation and then to 81.77 (+/- 11.25) mmHg 1 minute after intubation in Group M. In Group A, it was 56.7 (+/- 4.67) mmHg prior to intubation, 57.37 (+/- 3.21) mmHg during intubation and 66.1 (+/- 7.76) mmHg 1 minute after intubation.

The increase in diastolic blood pressure during and 1 min after intubation was statistically highly significant with p value of <0.001 in both the groups and was found to be more with the McCoy laryngoscope than with the Airtraq laryngoscope.

Mean arterial pressure

The mean arterial pressure was 72.50 (+/- 7.47) mmHg prior to intubation and increased to 81.0 (+/-10.92) mmHg during intubation and further to 97.17 (+/-11.65) mmHg 1 minute after intubation in Group M. In Group A, it was 70.17 (+/- 5.36) mmHg prior to intubation, 72.27(+/- 3.48) mmHg during intubation and 81.17(+/- 8.06) mmHg 1 minute after intubation.

The increase in mean arterial pressure during and after intubation was statistically highly significant ($p<0.001$) and was more with the McCoy laryngoscope compared to the Airtraq laryngoscope.

The result we obtained on haemodyanamic variables correlated with the previous studies showing that the Airtraq laryngoscope to be associated with less haemodynamic alterations compared to the McCoy laryngoscope. Though the McCoy laryngoscope is deemed to be associated with less haemodynamic alterations compared to the Macintosh laryngoscope due to the presence of hinged tip which helps in visualisation of glottis without the need for exaggerated lifting force, our study showed a significant haemodynamic alteration with the McCoy laryngoscope compared to the Airtraq laryngoscope.

We did not get any significant desaturation in any of the patients in our study. We could not intubate 2 patients in Group M in single attempt though the CLG was II. We reintubated them with the help of bougie in the second attempt. Similarly, in Group A, we found it difficult to guide the ETT into glottis though the CLG was I. So we guided the ETT with the help of bougie during the second attempt. There was no ‘failure to intubate’ situation in any of the patients.

Airway trauma

Blood stain on the laryngoscope was considered as evidence for airway soft tissue trauma and the incidence was found to be equal in both the groups. There was no incidence of dental trauma or any other airway complications in both the groups.

Limitations

Of the study

- The operator could not be blinded to the study.
- Majority of the airway parameters observed were subjective. However IDS which is more of objective one, was also noted down to minimise this error.
- All the Airtraq intubations were carried out by a single operator after a sufficient period of training. The result may vary with inexperienced hands. However the learning curve for Airtraq laryngoscope is short as proved by various trials.

Of the Airtraq

- Though the Airtraq is claimed to result in better visualization of glottis, the panoramic view of airway structure associated with Airtraq was less than with conventional direct laryngoscope.
- Laryngoscopy time and Time to intubate was more with the Airtraq than with the McCoy, however the reverse could happen in difficult airway situations.
- The cost may be a drawback for its routine use.

Conclusion

CONCLUSION

With the observations from the present study, it is concluded that

1. Airtraq optical laryngoscope provides a better visualization of glottis when compared to McCoy laryngoscope.
2. Airtraq optical laryngoscope provides a better intubating condition with improved Intubation difficulty score when compared to McCoy laryngoscope.
3. Airtraq optical laryngoscope results in minimal haemodynamic alteration in response to laryngoscopy and intubation when compared to McCoy laryngoscope.
4. The incidence of airway trauma is similar with both the laryngoscopes.

Summary

SUMMARY

To summarise, the technique of laryngoscopy which forms an important step in general anaesthesia, should produce a good glottic view, facilitate easy intubation with minimal haemodynamic alterations and airway complications.

The comparative study of McCoy and Airtraq laryngoscope, conducted on 60 patients with normal airway showed that the Airtraq optical laryngoscope to be superior to the McCoy laryngoscope with respect to glottic view, intubating condition and haemodynamic alteration.

However ease of insertion was better with the McCoy laryngoscope than with the Airtraq laryngoscope. Laryngoscopy time and time to intubate were also less in the McCoy laryngoscope when compared to the Airtraq laryngoscope in normal airway patients. Though Airtraq is promising to be superior to McCoy laryngoscope in difficult airway scenarios, the cost may be a drawback for its routine use.

Bibliography

BIBLIOGRAPHY

1. Dorsh JA, Dorsh SE.Laryngoscopes. In: Understanding Anesthesia Equipment. 5th ed. Philadelphia: Lippincott Williams and Wilkins; 2008:521.
2. Takeshima K, Noda J, Higaki M.Cardiovascular response to rapid anaesthesia and tracheal intubation. Anaesthesia Analogue 1964;43:201-208.
3. Tomore Z, Widdicombe JG, Muscular bronchomotor and cardiovascular reflexes elicited by mechanical stimulation of the respiratory tract. J Physiology 1969; 200:25-49.
4. Prys RG, Green IT, Meloche R, Foex P. Studies of anaesthesia in relation to intubation. Br J Anaesth 1971; 531-547.
5. Hassan HG, EI-Sharkawy TY, Renck H, Mansour G, Fouda A. Haemodynamic and catecholamine responses to laryngoscopy with vs without endotracheal intubation. Acta Anaesthesiology 1991; 35:442-427.
6. McCoy EP, Mirakhur RK, Rafferty C, et al. A comparison of the forces exerted during laryngoscopy. The Macintosh versus the McCoy blade. Anaesthesia 1996;51:912-915.

7. McCoy EP, Mirakhur RK, McCloskey BV. A comparison of the stress response to laryngoscopy. The Macintosh versus the McCoy blade. Anaesthesia 1996;50:943-946.
8. Khan RM. Airway assessment. In Khan RM, Maroof M, editors. Airway management. 4th ed. Hyderabad: Paras medical publisher; 2011:58-59.
9. Henderson J. Airway management in the adult. In: Miller RD, Eriksson LI, Fleisher LA, Wiener – Kronish JP, Young WL, editors. Miller's Anesthesia. 7th ed. Philadelphia: Elsevier, Churchill Livingstone; 2010; 2:1587.
10. Sukhupragarn W, Rosnblatt WH. Airway management. In: Barash PG, Cullen BF, Soelting RK, Cahalan MK, Stock MC, editors. Clinical Anaethesia. 6th ed. Philadelphia: Lippincott Williams and Wilkins; 2009:778.
11. Khan RM. Airway assessment. In Khan RM, Maroof M, editors. Airway management. 4th ed. Hyderabad: Paras medical publisher; 2011:121.
12. Journal of the history of medicine and allied sciences 1946; 1:583-94.
13. Snows J. On chloroform and other anaesthetics. London: John Churchill; 1858.

14. Macewen W. Cilinical observation on the introduction of tracheal tubes by the mouth instead of performing tracheotomy or laryngotomy. Brit Med J 1880; 2:2122-2124.
15. Kristein A. Autoskopie des larynx under trachea. Berlin Klin Wschr 1895; 32:476-478.
16. Hirsch NP, Smith GB, Hirsch PO. Alfred Kirstein: Pioneer of direct laryngoscopy. Anaesthesia 1986; 41:42-45.
17. Jackson C. The technique of insertion of intratracheal insufflations tubes. Surg Gynec Obstet 1913; 17:507-509.
18. Janeway HH. Intra-tracheal anesthesia from the standpoint of the nose, throat and oral surgeon with a description of a new instrument for catheterizing the trachea. Laryngoscope 1913; 23:1082-1090.
19. Philips OC, Duerksen RL. Endotracheal intubation: A new blade for direct laryngoscopy. Anesthesia and Analgesia 1973; 525:691-697.
20. Miller RA. A new laryngoscope. Anesthesiology 1941; 2:317-320.
21. Macintosch RR. Laryngoscope blades. Lancet 1944; 1:485.
22. Khan RM. Airway assessment. In Khan RM, Maroof M, editors. Airway management. 4th ed. Hyderabad: Paras medical publisher; 2011:60.

23. Harold Ellis, Stanley Feldman, William Harrop-Griffiths with a chapter on Anatomy of Pain by Andrew Lawson. Anatomy for Anaesthetists. 8th ed. Blackwell publishing; 2003:7-38.
24. Isaacs RS, Sykes JM. Anatomy and physiology of the upper airway. Anesthesiol Clin N Am 2002; 20:733-735.
25. Snell RS. Larynx. In: Clinical Anatomy, 5th ed. Phildelphia: Lippincott Williams and Wilkins; 2004:864-875.
26. Fung DM, Devitt JH. The anatomy, physiology and innervations of the larynx. Anesthesiol Clin N Am 1995; 13:259-275.
27. Khan RM. Airway assessment. In Khan RM, Maroof M, editors. Airway management. 4th ed. Hyderabad: Paras medical publisher; 2011:21.
28. Samsoon GL, Young JR. Difficult tracheal intubation: a retrospective study. Anaesthesia 1987; 42:487-490.
29. Khan RM. Airway assessment. In Khan RM, Maroof M, editors. Airway management. 4th ed. Hyderabad: Paras medical publisher; 2011:20-34.
30. Padmaja Durga, Chiranjeevi Yendrapati, Geeta Kaniti, Narmadha Padhy, Kiran Kumar Anne, Gopinath Ramachandran. Effect of rigid cervical collar on tracheal intubation using Airtraq: a randomized open labelled cross over study. Indian Journal of Anaesthesia. 2014; 58:4:416-422.

31. Dorsh JA, Dorsh SE.Laryngoscopes. In: Understanding Anesthesia Equipment. 5th ed. Philadelphia: Lippincott Williams and Wilkins; 2008:521-537.
32. AIRTRAQ OPTICAL LARYNGOSCOPE (package insert). Las Arena, Spain: Prodol Meditech Limited; 2009.
33. Shribman AJ, Smith G, Achola KJ. Cardiovascular responses to laryngoscopy with and tracheal intubation. British Journal Anaesthesia 1987;59:295-299.
34. Maharaj CH, O’Croinin D, Curley, Harte BH, Laffery JG. A comparison of tracheal intubation using the Airtraq or the Macintosh laryngoscope in routine airway management: a randomized, controlled clinical trial. Anaesthesia 2006; 61:1093-1099.
35. Maharaj CH, Costello JF, Harte BH, Laffey JG. Evaluation of the Airtraq and Macintosh laryngoscope in patient at increased risk for difficult tracheal intubation. Anaesthesia 2008; 63:182-188.
36. Tomasz Gaszyński, Wojciech Gaszyński. A comparison of the Airtraq optical and the standard Macintosh laryngoscope for endotracheal intubation in obese patients. Anaesthesiology Intensive Therapy, 2009, XLI,3;116-119.

37. Savoldelli GL, Schiffer E, Abegg C, Baeriswyl V, Clergue F, Waeber JL. Comparison of the Glidescope, the McGrath, the Airtraq and the Macintosh laryngoscopes in simulated difficult airways. Anaesthesia 2008; 63:1358-1364.

38. Sherren PB et al. Comparison of the Macintosh, McCoy, Airtraq laryngoscopes and the intubating laryngeal mask airway in a difficult airway with manual in-line stabilisation: a cross-over simulation-based study. European Journal of Anaesthesiology, 08/08/2013 Clinical Article.

39. Arino, J.; Velasco, J.; Civantos, G.; Martinez, O.; Lopez-Timoneda, F. Comparison of the Airtraq and McCoy laryngoscopes for endotracheal intubation: 19AP5-4. European Journal of Anaesthesiology: May/June 2008; 25:247–248.

40. Mehtab A Haidry, Fauzia A Khan. Comparison of hemodynamic response to tracheal intubation with Macintosh and McCoy laryngoscopes. J Anaesthesiol Clin Pharmacol. 2013 Apr-Jun;29(2):196–199.

41. Padmaja Durga, Chiranjeevi Yendrapati, Geeta Kaniti, Narmadha Padhy Kiran Kumar Anne, Gopinath Ramachandran. Effect of rigid cervical collar on tracheal intubation using Airtraq: a randomized open labelled cross over study. Indian Journal of Anaesthesia. 2014;58:4:416-4

Annexures

PROFORMA

NAME : HT/WT :

AGE/SEX : BMI :

IP NO : GROUP :

DATE : DIAGNOSIS:

ADDRESS : PLAN :

PREOP ASSESSMENT:

ASA - ALLERGY -

COMORBID ILLNESSES - PREVIOUS SURGERY –

AIRWAY:

IID - NECK CIRCUMFERENCE -

LENGTH OF UI - NECK MOVEMENTS -

BUCK TEETH - TMD -

ULB - SMD -

PALATE - MPC -

INTRA OP:

PREMEDICATION :

PREOXYGENATION : 100%O2

INDUCTION :

INTUBATION :

MAINTENANCE :

RECOVERY :

PARAMETERS

Events	Time (am/pm)	SBP (mmHg)	DBP (mmHg)	MAP (mmHg)	PR (bpm)	SPO_2 %	Remarks
Baseline							
PI							
I							
AI (1 min)							

- **Ease of insertion (Likert's scale):**
- **Laryngoscopy time:**
- **Cormack and Lehane grading:**
- **Time to intubate:**
- **Intubation difficulty score:**
- **Airway trauma:**

நோயாளி சம்மதக் கடிதம்

எனது அறுவைசிகிச்சையை மேற்கொள்ள, மயக்கமருந்து அளிக்கும் பொழுது செயற்கைக் குழாயை குரல்வளை வழியாக மூச்சுக் குழாயினுள் பொறுத்த இரண்டு வெவ்வேறு உபகரணங்களை பயன்படுத்துவதில் எனக்கு சம்மதம்.

அனைத்து மருத்துவ முறைகளிலும் இருப்பது போல் இம்மருத்துவ முறையிலும் எதிர்பாரா இடர்கள் நேரிடலாம்.

உங்கள் மருத்துவப் பதிவேடுகள் மிகவும் அந்தரங்கமாக வைத்துக் கொள்ளப்படும். இந்த ஆய்வின் முடிவுகள் அறிவியல் பத்திரிக்கைகளில் பிரசுரிக்கப்படலாம். ஆனால் உங்கள் இரகசியத்தன்மை பாதுகாக்கப்படும். இந்த ஆய்விலிருந்து தாங்கள் எந்த நேரமும் காரணம் இல்லாமல் விலகிக் கொள்ளலாம். எப்படி இருந்தாலும், தேவையான சிகிச்சை அளிக்கப்படும்.

மேற்கூறிய மருந்துவத் தகவல்களை இந்த ஆய்வினை மேற்கொள்ளும் மருத்தவர் மூலம் அறிந்த நான் தன்னிச்சையாக இந்த ஆய்வில் பங்கேற்கிறேன்.

இந்த ஆய்வு சம்பந்தமாகவோ, இதை சார்ந்த மேலும் மேற்கொள்ளும் மற்ற ஆய்வுகளில் பங்கேற்கும் மருத்துவர் என் மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என்பதை அறிவேன்.

எனது நலன் கருதியே இந்த ஆய்வு மேற்கொள்ளப்படுகிறது என தெரிந்து இந்த ஆய்விற்கு சம்மதிக்கிறேன்.

கையொப்பம் / இடதுகை
கட்டைவிரல் கைநாட்டு

MASTER CHART

GROUP M																														
																HR			SBP			DBP			MAP					
S.No	Name	Group	Age	Sex	IP No.	Diagnosis	Surgery	Wt	Ht	BMI	ASA	MPC	EOI	LT	CLG	PI	I	AI	PI	I	AI	PI	I	AI	PI	I	AI	TTI	IDS	AT
1	Mahalakshmi	1	41	F	60660	Carcinoma breast Rt	MRM Rt	61	155	25	II	II	1	10	II	86	99	108	110	113	121	62	66	82	78	82	95	16	2	N
2	Lakshmi	1	45	F	61088	CSOM Lt	Tympanomastoidectomy	58	152	25	I	II	2	8	II	61	79	82	105	116	146	69	71	94	81	86	111	15	1	N
3	Shalia	1	45	F	3055	CSOM Rt	Tympanomastoidectomy	51	157	21	I	I	2	9	I	71	84	88	96	98	107	65	70	76	75	79	86	14	1	N
4	Meena	1	34	F	3918	IVDP L4-5	Microdiscectomy	58	146	27	II	I	2	11	II	97	102	96	106	111	144	67	74	94	80	86	110	15	2	N
5	Ramesh	1	33	M	4216	Ethmoid polyp RT	FESS	55	165	20	I	I	2	10	I	54	81	82	97	123	113	61	82	68	73	96	83	15	0	N
6	Jothi	1	26	F	4184	CSOM Lt	Tympanomastoidectomy	43	152	19	I	I	2	13	I	83	88	97	92	108	116	56	66	78	68	80	91	17	1	N
7	Veerasamy	1	48	M	4067	DNS	Septoplasty	58	158	23	II	II	1	10	II	106	118	123	117	124	142	82	91	104	94	102	117	18	2	N
8	Nagalakshmi	1	38	F	5748	Chronic appendicitis	Lap appendicectomy	58	155	24	I	II	1	9	I	89	91	111	103	122	139	58	68	76	73	86	97	13	1	N
9	Fairose	1	23	F	6390	CSOM Lt	Tympanomastoidectomy	54	155	23	I	I	2	14	I	86	102	109	97	113	121	60	62	80	72	79	94	18	0	N
10	Panayandian	1	33	M	6463	Pansinusitis	FESS	65	162	25	I	I	2	10	II	60	93	94	92	144	142	59	103	98	67	113	110	14	3	Y
11	Dhanabakyam	1	55	F	5854	Carcinoma breast Lt	MRM Lt	65	155	27	II	I	2	10	I	89	92	90	122	123	140	77	80	94	87	91	105	16	1	N
12	Ramamoorthy	1	22	M	16056	Ethmoid polyp RT	FESS	55	165	20	I	I	2	9	I	60	65	94	103	108	118	66	66	74	75	77	84	15	0	N
13	Meena	1	33	F	9726	CSOM Rt	Tympanomastoidectomy	45	155	19	I	II	2	12	II	97	103	108	87	88	105	50	51	62	60	59	72	19	3	Y
14	Rajamanickam	1	39	M	20951	Ethmoid polyp RT	FESS	60	155	25	II	II	2	11	II	65	77	80	96	114	142	53	81	99	63	89	113	17	2	N
15	Kauvery	1	28	F	9126	CSOM Rt	Tympanomastoidectomy	45	150	20	I	II	2	12	II	89	96	93	90	98	153	50	52	79	63	67	104	20	3	N

16	Raja	1	25	M	7886	Ethmoid polyp B/L	FESS	55	158	22	I	I	1	18	I	80	82	92	98	99	114	59	64	68	72	76	83	24	1	N
17	Shanthi	1	49	F	15514	Carcinoma breast Rt	MRM Rt	54	154	23	I	I	2	10	I	115	118	124	99	105	115	66	73	76	77	84	89	15	0	N
18	Manimegalai	1	44	F	14950	Carcinoma breast Lt	MRM Lt	55	153	24	II	II	2	15	II	62	64	82	113	128	152	65	78	98	81	95	116	45	5	Y
19	Ezhumalai	1	43	M	3342	IVDP L4-5	Microdiscectomy	64	167	23	I	I	2	11	II	72	79	92	98	104	132	54	60	72	69	75	92	18	0	N
20	Saghayamary	1	32	F	7754	CSOM Lt	Tympanomastoidectomy	62	155	26	I	II	2	10	II	88	92	104	101	109	132	55	61	75	70	77	94	16	1	N
21	Noorul ameen	1	37	M	16990	Ethmoid polyp RT	FESS	64	167	23	I	I	2	9	I	76	81	84	99	104	121	62	66	80	74	79	94	18	0	N
22	Rajeshwari	1	52	F	9777	Carcinoma breast Lt	MRM Lt	67	155	28	II	II	1	14	II	96	102	104	92	104	141	54	60	81	67	77	101	19	3	N
23	Ammu	1	21	F	16220	DNS	Septoplasty	50	156	21	I	I	2	10	I	66	67	74	102	107	118	50	54	63	67	72	81	15	0	N
24	Arokyaraj	1	47	M	8993	IVDP L5-S1	Microdiscectomy	67	171	23	II	I	2	11	I	102	104	129	88	92	114	51	55	66	63	67	82	17	2	N
25	Senthilkumar	1	38	M	12289	CSOM Rt	Tympanomastoidectomy	62	159	25	I	I	2	10	I	79	81	95	113	117	131	62	66	88	79	83	102	16	1	N
26	Anbarasi	1	44	F	17723	CSOM Lt	Tympanomastoidectomy	58	155	24	I	II	2	11	II	65	66	86	92	102	129	55	58	84	67	73	99	16	1	N
27	Arivoli	1	45	M	6751	Ethmoid polyp	FESS	60	162	23	I	II	2	12	II	71	77	89	103	104	123	54	54	79	70	71	94	18	1	N
28	Thenmozhi	1	28	F	5569	DNS	Septoplasty	53	157	22	I	I	2	9	I	77	82	95	107	112	134	57	59	87	74	77	103	15	0	N
29	Ramayi	1	58	F	13245	Carcinoma breast Rt	MRM Rt	67	156	28	II	II	2	14	II	69	73	96	97	105	153	53	64	92	68	78	112	48	5	Y
30	Jacob	1	43	M	5645	Ethmoid polyp	FESS	60	157	24	I	I	2	10	I	101	100	123	96	97	132	61	62	86	73	74	101	15	0	N

GROUP A

																	HR			SBP			DBP			MAP				
S.No.	Name	Group	Age	Sex	IP No.	Diagnosis	Surgery	Wt	Ht	BMI	ASA	MPC	EOI	LT	CLG	PI	I	AI	PI	I	AI	PI	I	AI	PI	I	AI	TTI	IDS	AT
2	Saraswathy	2	55	F	11453	Carcinoma breast Rt	MRM Rt	65	155	27	II	II	1	16	I	65	69	70	98	101	110	56	60	64	70	74	79	26	1	N
3	Dheivanai	2	57	F	11108	Carcinoma breast Rt	MRM Rt	59	153	25	II	I	1	14	I	102	104	110	108	106	116	63	64	71	78	78	86	22	1	N
4	Rajalakshmi	2	50	F	8661	Cholecystitis	Lap cholecystectomy	63	150	28	I	I	0	15	I	82	88	94	102	104	110	60	61	71	74	75	84	21	1	N
5	Rajan	2	25	M	15694	CSOM Lt	Tympanomatoidectomy	55	160	22	I	I	1	12	I	59	63	65	99	102	101	61	60	64	74	74	76	18	0	N
6	Ansabegam	2	47	F	25754	Cholecystitis	Lap cholecystectomy	68	155	28	II	II	0	17	I	99	102	112	89	92	104	52	55	58	64	67	73	27	1	Y
7	Jesintha	2	52	F	19981	IVDP L4-5	Microdiscectomy	60	152	26	II	I	0	16	I	69	71	76	103	107	115	60	61	66	74	76	82	25	1	N
8	Bhuvaneshwari	2	30	F	6371	Chronic appendicitis	Lap appendicectomy	53	154	22	I	I	1	12	I	80	81	92	87	91	96	52	56	63	64	68	74	19	1	N
9	Balamurugan	2	55	M	12890	CSOM Rt	Tympanomatoidectomy	57	161	22	I	II	1	15	I	61	63	69	94	96	105	52	52	59	66	67	74	26	1	N
10	Balamani	2	52	F	35112	Phylloides tumour Rt breast	Simple mastectomy	61	156	25	I	II	1	14	I	94	99	102	107	109	123	65	64	83	79	78	96	27	2	Y
11	Ganesan	2	40	M	25390	DNS	Septoplasty	52	157	21	I	I	1	16	I	75	76	86	101	105	119	56	59	65	71	74	83	23	1	N
12	Rajesh	2	28	M	11902	DNS	Septoplasty	66	165	24	I	II	0	18	I	54	57	62	117	110	125	72	71	78	87	84	94	26	1	N
13	Selvi	2	40	F	5691	Chronic appendicitis	Lap appendicectomy	57	152	25	I	I	1	15	I	76	80	81	95	99	100	55	57	56	68	71	71	22	1	N
14	Jamila	2	38	F	11710	Ethmoid polyp	FESS	59	156	24	II	II	0	17	I	88	91	97	100	104	113	54	53	63	69	70	80	27	1	N
15	Arunachalam	2	55	M	26322	IVDP L5-S1	Microdiscectomy	65	168	23	I	II	1	13	I	67	71	74	93	96	95	54	52	53	67	67	67	18	1	N

16	Hajina begham	2	39	F	9877	DNS	Septoplasty	55	154	23	I	I	1	11	I	85	88	92	98	99	105	53	56	62	68	70	76	15	0	N
17	Ranjith	2	21	M	10933	Sub acute appendicitis	Lap appendicectomy	52	160	20	I	I	1	17	I	65	67	73	105	109	124	57	56	75	73	74	91	26	1	N
18	Latha	2	35	F	9937	CSOM Rt	Tympanomatoidectomy	56	151	25	II	I	1	13	I	76	82	83	89	95	99	51	55	62	64	68	74	21	1	N
19	Gurusamy	2	43	M	34891	Ethmoid polyp	FESS	62	168	22	I	II	1	12	I	103	107	109	92	99	102	53	55	61	66	70	75	20	1	N
20	Ayshwarya	2	24	F	29710	CSOM Rt	Tympanomatoidectomy	50	158	20	I	I	1	15	I	75	80	86	102	108	111	56	58	63	71	75	79	23	1	N
21	Juli	2	35	F	6209	DNS	Septoplasty	51	157	21	I	I	1	13	I	93	95	102	101	105	116	57	55	68	72	72	84	19	1	N
22	Ramanathan	2	32	M	18812	CSOM Rt	Tympanomatoidectomy	66	163	25	I	II	1	14	I	89	88	95	96	98	108	53	55	62	67	69	77	25	1	N
23	Karuppaiyan	2	41	M	7307	Ethmoid polyp	FESS	65	159	26	I	II	1	15	I	67	72	89	95	103	132	55	61	87	68	75	102	55	4	Y
24	Nalini	2	28	F	27071	CSOM Lt	Tympanomatoidectomy	55	157	22	I	I	1	14	I	79	85	91	102	108	127	59	58	75	73	75	92	20	1	N
25	Rathnam	2	55	F	5981	Carcinoma breast Rt	MRM Rt	62	152	27	II	II	0	17	I	65	67	84	91	95	102	52	54	66	65	68	78	24	1	N
26	Vaani	2	31	F	11087	Chronic appendicitis	Lap appendicectomy	55	152	24	I	II	1	14	I	79	82	85	97	102	125	59	58	76	72	73	92	23	1	N
27	Meenambigai	2	40	F	20981	Ethmoid polyp	FESS	57	156	23	I	I	1	12	I	65	68	71	102	105	114	62	59	62	75	74	79	19	0	N
28	Vembu	2	38	M	6125	Ethmoid polyp	FESS	58	165	21	I	I	1	15	I	104	106	116	90	94	106	52	53	61	65	67	76	21	1	N
29	Kannaiyan	2	49	M	8123	Cholecystitis	Lap cholecystectomy	69	164	26	I	II	1	13	I	75	82	88	103	107	115	55	59	63	71	75	80	24	1	N
30	Nagamani	2	32	F	27931	Ethmoid polyp	FESS	57	160	22	II	I	1	12	I	88	89	90	101	103	116	58	58	62	72	73	80	23	1	N

KEY TO MASTER CHART

S. No	**:**	**Serial Number**
M	**:**	**Male**
F	**:**	**Female**
IP NO	**:**	**Inpatient number**
BMI	**:**	**Body mass index**
ASA	**:**	**American society of Anaesthesiologists**
MPC	**:**	**Mallampati classification**
EOI	**:**	**Ease of insertion**
LT	**:**	**Laryngoscopy time**
CLG	**:**	**Cormack and Lehane grading**
PI	**:**	**Prior to intubation**
I	**:**	**Intubation**
AI	**:**	**After intubation**
TTI	**:**	**Time to intubate**
IDS	**:**	**Intubation difficulty score**

AT	**:**	**Airway trauma**
MRM	**:**	**Modified radical mastectomy**
Rt	**:**	**Right**
Lt	**:**	**Left**
CSOM	**:**	**Chronic suppurative otitis media**
IVDP	**:**	**Intervertebral disc prolapse**
FESS	**:**	**Funtional endoscopic sinus surgery**
DNS	**:**	**Deviated nasal septum**
Lap	**:**	**Laproscopic**
DNS	**:**	**Deviated nasal septum**